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JOHN CERAR

# Contractors and Engineers Monthly

Vol. 43, No. 9

SEPTEMBER, 1946

\$3 a Year, 25 Cents a Copy

## Covering the Field

### • Highway Grading

An 863,000-yard mountain job with deep cuts and fills is described on this page.

Page 71 tells how scrapers moved 235,000 yards to widen 6 miles of out-dated road and eliminate its bad curves.

### • Sea Wall Reinforced

To bolster a concrete sea wall against Atlantic erosion, lengths of steel sheet piling were driven and fastened to it, as described on this page.

### • County Road Work

A county disperses its fleet of light speedy trucks and snow plows to cope with 30 to 65-inch snowfalls. See page 1.

An agricultural county meets equipment shortages with its repair shop, and an inadequate budget with the use of native road materials, as told on page 37.

### • Airport Construction

Problems in constructing a 7,000-foot runway and 4,500-foot taxiway for 120,000-pound loading at an Army airfield were sugar-sand soil and drainage at sea level. See page 2.

A fleet of scraper units moved 333,000 yards in three months for a new airport. The job is described on page 68.

### • Dredging Improves Harbor

The San Diego handled 40,000 yards daily on a 2,600,000-cubic-yard job to deepen the anchorage at the San Diego Destroyer Base. Page 6 features this project.

### • New Bridge Replaces Old

In building a 4-span concrete and steel bridge, the contractor used a crane on each river bank to drive steel sheet pile cofferdams for the piers. See page 10.

### • Highway Maintenance

The contribution to road maintenance made by a state highway shop's ingenious methods of equipment care is described on page 17.

### • Roadside Planting

Methods of planting some 6,000 dogwood trees as a war memorial along a main state highway are described on page 27.

### • New Earth-Fill Dam

On the site for a new earth-fill dam for water supply, described on page 55, difficult access and solid rock marked the excavating for the permanent outlet tunnel, abutments, and spillway.

### • Tar and Gravel Road

See page 65 for an account of laying the gravel sub-base and surface course of mulched tar and sand on 3.1 miles of old secondary road.

### • Wages for Highway Work

Contractors are reminded on page 74 that, under current regulations, they must get WAB approval for any wage changes.

### • Concrete Paving Job

As reported on page 78, the laying of a 4.1-mile stretch of dual concrete pavement included joint-spacing tests on a 21,760-foot test section.

(You will find "In This Issue" on page 4)

## New Highway Has Cuts 106 Feet Deep

### Clearing and 863,000 Yards of Dirt and Rock Moved in Advance of Road-Mix Surfacing

LONG before the last depression was upon us, men were busy in Oregon blasting the Pacific Coast Highway through its mountains. U. S. 99 was built north and south across the state, and as the years passed it was improved as much as possible.

About 17 miles north of Grants Pass, the highway winds a tortuous course up and down mountains, along two meandering streams, and through miles of pine and spruce. Present-day traffic made it necessary for the Oregon State Highway Commission to realign that section between Wolf Creek and Grave Creek. On May 21, 1945, a contract for the grading, bridge structures, rock blanket, and road-mix surfacing was awarded to McNutt Brothers, contractor of Eugene, Oregon.

Approximately 863,000 cubic yards of excavation went for the contract price of 30 to 35 cents per cubic yard, depending on location, material, and length of haul. Cuts up to 106 feet deep and fills up to 118 feet made the job spectacular and dangerous.

### Clearing

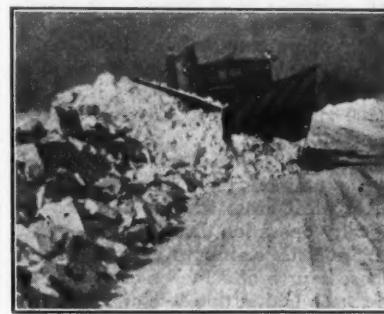
Work started as soon as the contract was awarded. The new route lay in virgin timber; all but about  $\frac{1}{2}$  mile was in a new location. It was a straight route through mountains covered with pine, fir, and laurel trees. The Oregon rainy season had been heavy, and the trees were thick and green.

The largest trees were felled by power crosscut saws, but the smaller trees were rooted out by four Caterpillar D8 tractors carrying Isaacson clearing blades. All brush was piled by the blades, and later burned. It was

(Continued on page 48)



C. & E. M. Photo  
U. S. 99 in Oregon passes through mountainous terrain. In relocating a section north of Grants Pass, McNutt Brothers faced the problem of cuts up to 106 feet deep and fills to 118 feet.



Snow need not be a problem if equipment is adequate, says the La Crosse County, Wis., Highway Commissioner. Among this county's units is a Frink V-plow mounted on a heavy-duty four-wheel-drive Oshkosh truck, shown here moving snow further back from the plowed way.

## Snow Fleet Dispersed For Maximum Economy

### Tips on How One County Solves Winter Maintenance Problems in Severe Snow Conditions

A FLEET of 1½-ton trucks with one-way snow plows is dispersed in twelve patrol sections throughout the 481 square miles of La Crosse County, Wis. With it, the County efficiently and economically keeps 280 miles of county highways open to traffic during a snow season that sometimes lasts almost six months, at a cost of from \$50 to \$80 per mile.

Snowfall in this western Wisconsin county, which is bounded by rocky bluffs and rolling wooded hills, averages from 30 to 65 inches a year. But Paul A. Hartwig, County Highway Commissioner, declares that snow removal is not nor need not be a problem if a highway department is adequately equipped.

"We have placed increasing emphasis on light speedy units such as 1½-ton trucks with one-way plows. With them we have developed a snow-fighting force with low operating cost which is entirely adequate for all but the most unusual conditions," declares Mr. Hartwig. He has been in charge of the La Crosse County Highway Department for ten years.

### Organization and Methods

The division of the county into twelve patrol sections is the backbone of the La Crosse County winter-maintenance program. A patrolman and helper are assigned to each section and are provided with a Ford, Chevrolet, GMC, or Diamond T 1½-ton truck. The truck is equipped with a Wisconsin Special, Frink, or Austin-Western one-way hand-operated plow, as well as with an 8-foot pull-type grader and small tools. Sand from commercial pits in the county is treated with 50 pounds of calcium chloride per cubic yard and stockpiled in each patrol section well in advance of the snow season. During the winter, the patrol trucks are at all times loaded with sand. This serves the double purpose of providing ballast for the trucks and abrasive for sanding grades.

(Continued on page 88)

## Piling Reinforces Sea Wall and Walk

### Sheeting Driven and Braced By Timbers at Front of Beach Walk Where Ocean Had Caused Erosion

By WILLIAM H. QUIRK, Editor, and Eastern Field Editor

DAMAGE which the mighty Atlantic can do in a few hours at the peak of a northeaster can take months of hard labor to restore. This was graphically illustrated this year at Virginia Beach, Va. There a section of the concrete wall which carries the concrete sea-front walk was reinforced with steel sheet piles, to prevent further erosion and threat of heavy property damage to hotels. Along several stretches of this well known oceanside resort in southern Virginia, violent wave action had gouged openings beneath the existing wall. As the waters moved in and out of the breached rampart, tons upon tons of sand were washed out to sea by the undertow. They left behind great holes, not only under the "board" walk but also extending inland nearly to the building lines of some hotels.

To prevent a repetition of this erosion, the City of Virginia Beach designed a cut-off wall consisting of 2,900 linear feet of steel sheet piling 6 feet long, which was to be placed in front of the existing concrete wall. It engaged the Vanguard Construction Corp. of New York City to do the work. The job began at 7th Street and continued north to a point between 14th and 15th Streets, the area where the storms had proved most troublesome. Work started on January 4 of this year, and 722 linear feet of 6-foot sheet piling had been driven when lack of material put a halt to further activity.

In February another violent storm struck from the northeast. It swept the

(Continued on page 88)



C. & E. M. Photo  
A Northwest with a 50-foot boom and Haiss ½-yard clamshell throws up a sand dike in front of a section of walk being repaired at Virginia Beach.

# Subgrade Stabilization, Hot-Mix for Runways

**New Facilities at B29 Base Provide for 120,000-Pound Loading; \$1,750,000 Program Enlarges Heavy-Bomber Field**

♦ **SUBGRADES** stabilized with lime rock and compacted to bear 120,000-pound gross loadings feature the \$1,750,000 improvement and reconstruction program recently completed at MacDill Field, near Tampa, Fla. These subgrades form the consolidated foundations for a 7,000-foot runway and a 4,500-foot taxiway.

The sea-level field on Tampa Bay was constructed for the Army Air Forces under the direction of the United States Engineer Office at Savannah, Ga. It has been enlarged and expanded to provide adequate landing and take-off areas for Uncle Sam's heavy eagles, including the B29's which, with loads of atomic and super bombs, hastened victory by reducing their targets to ashes and dust.

During the war, MacDill Field was an important training center for Very Heavy Bombers, the Air Forces' designation for the category which includes the B29. Shortly before the sudden and dramatic end of hostilities, a tremendous expansion program was approved for the Florida air field. The five existing runways, including one strip 10,000 feet long, were to be supplemented by a new runway designed for B29 take-offs and several new taxiways. Existing runways and aprons were to be reinforced and overlaid with lime rock and bituminous material for the B29 loading.

The Army Engineers awarded the contract for new construction and reconstruction at the field to the W. C. Shepherd Co., Inc., of Atlanta, Ga. On June 30, 1945, three 12-yard Tournapull Super C's and three 16-yard Euclids began preliminary stripping and clearing operations. Not quite a month later, with work on the original contract less than 5 per cent completed, V-J Day was announced and the MacDill Field project was halted.

Despite the turmoil and confusion which characterized the first days of conversion from war to peacetime thinking and planning, it was decided within 30 days that MacDill Field would be retained as a permanent installation of the Air Forces. So the contractor was ordered to resume construction operations. The original contract was reduced about 50 per cent in scope after victory. Nevertheless, improvements as completed this summer cost in excess of \$1,750,000. The principal items of construction included the following:

By HOWARD V. PEHRSON,  
Field Editor

one new runway, 7,000 feet long x 300 feet wide, designed for 120,000-pound capacity operation over the center 150 feet and 120,000-pound limited operation over the 75-foot shoulders; one new taxiway, 4,500 feet long x 75 feet wide, designed for 120,000-pound capacity operation; stabilized end zones measuring 1,000 feet long x 300 feet wide; an addition to the apron area of 34,000 square yards; and drainage facilities. Moreover, existing runways and taxiways at intersections were overlaid with bituminous material.

A typical cross section designed for capacity operation discloses 6 inches of subgrade soil stabilized with lime rock; a base course of 8 inches of compacted lime rock laid in two lifts of 4 inches; a 1½-inch tar binder course; and a 1½-inch asphaltic-concrete surface.

Principal quantities involved in the MacDill Field contract were:



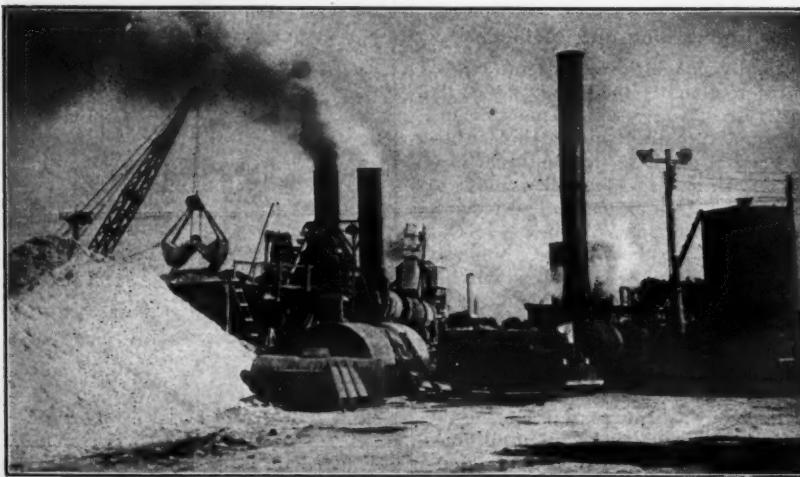
This Lorain dragline handled some of the 400,000 cubic yards of unclassified excavation in the improvement program at MacDill Field, Army Air Base at Tampa, Fla.

Stripping and removal of topsoil	85,000 cu. yds.
Unclassified excavation	400,000 cu. yds.
Overhaul (½-mile unit)	400,000 cu. yds.
Lime-rock stabilizing material	43,500 tons
Processing subgrade (stabilization)	389,000 sq. yds.
Double-course lime rock	168,000 tons
Single-course lime rock	18,000 tons
Tar prime	40,000 gals.
Cut-back asphalt (RC-2)	87,800 gals.
Asphalt and tar in bituminous mix	750,000 gals.
Tack coat (AC-8)	35,000 gals.
Sand cover	1,050 tons
Stone aggregate cover for seal	1,245 tons
Concrete paving	919 sq. yds.
Ditch-invert paving	6,000 sq. yds.
Concrete culverts	3,472 cu. yds.
Concrete pipe (15 to 48-inch)	22,456 lin. ft.
Wellpoints	32,500 lin. ft.
Bermuda-grass sprigging and overseeding	200 acres
Solid sod on ditches	1,000 sq. yds.

## Dirt Work

Clyde Shepherd was in charge of the project for the W. C. Shepherd Co., Inc. When he told the skimmers to warm up their diesels and start moving dirt again

(Continued on page 39)



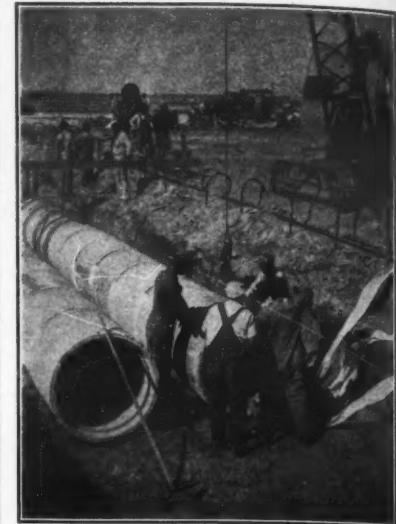
Paving for the new 7,000-foot runway and other improvements at MacDill Field was mixed in a Barber-Greene 848 continuous-feed asphalt plant turning out 800 to 900 tons a day. A Lorain 40 ½-yard crane unloaded and stockpiled the aggregate.

**New Drainage Facilities Are Included in Improvement; Runways Are Free of Water At Sea-Level Field**

♦ WHEN the Army Air Forces decided to expand facilities at MacDill Field, providing runways for 120,000-pound gross loadings was not the only problem confronting the Army Engineers who designed and supervised the work. Located at sea level on an arm of land jutting out into Tampa Bay, MacDill Field presented a major drainage problem.

But the problem has been worked out most effectively. Although some culverts were built at minus elevations and although full-grown Florida alligators occasionally turn up in the lowest drainage ditches, the runways and taxiways are rarely if ever under water.

Hand in hand with construction of the big new runway and taxiway went



The W. D. Owens subcontract for drainage facilities at MacDill Field included laying 22,456 linear feet of 15 to 48-inch concrete pipe. The Moretrench wellpoint system to keep the trench dry at this sea-level field is on the far side.

feet, with 3 to 1 slopes. All excavation for ditches was handled by a Lorain ¾-yard clamshell, which was followed by a crew of from ten to twelve men who shaped up the slopes with hand tools. Wellpoints were then driven in the sand to keep the ditches dry until precast concrete ditch liners could be placed.

## Wellpoint System

During the year-long construction project, the contractor used a total of 32,500 linear feet of wellpoints. A Moretrench wellpoint system comprised the main line of wellpoints, but as the job neared completion it became necessary to supplement this system with some footage of home-made wellpoints.

Wellpoints were driven into the sand for only 6 inches below the bottom elevation of the ditch and were spaced at average intervals of 5 feet. Diaphragm pumps were used almost entirely to pull the wellpoints.

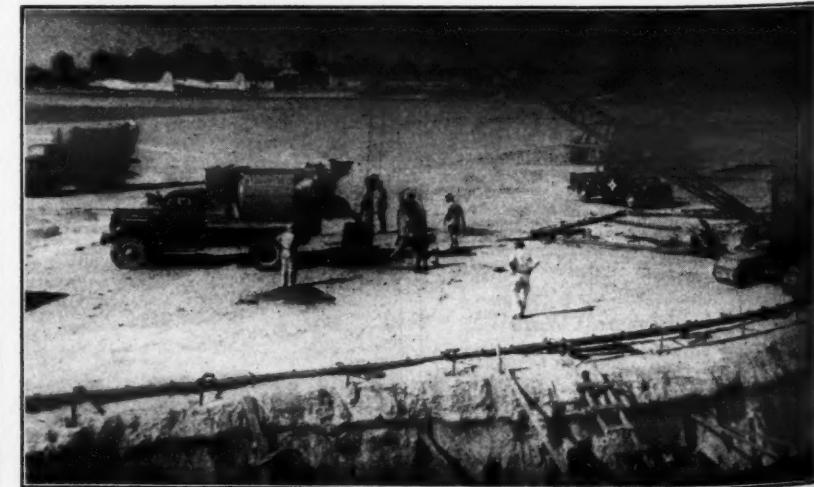
At one 1,500-foot drainage ditch under construction when the MacDill Field project was visited, the wellpoints were being pulled with two Marlow Mud Hog pumps with 4-inch intake and discharge; a Moretrench pump with 6-inch intake and discharge; and a centrifugal jet pump with 2-inch intake and discharge.

## Concrete Ditch Liners

After the drainage ditches were dried up by the wellpoints and dressed by hand-labor crews, the contractor was ready to start laying the precast concrete ditch liners along the ditch slopes. The individual ditch liners measured 27 inches by 12 inches and were 2 inches in thickness. They were laid along the bottom 4 feet of the slope to prevent erosion of the sandy slopes.

The ditch liners were precast on the job. Screenings were used as aggregate

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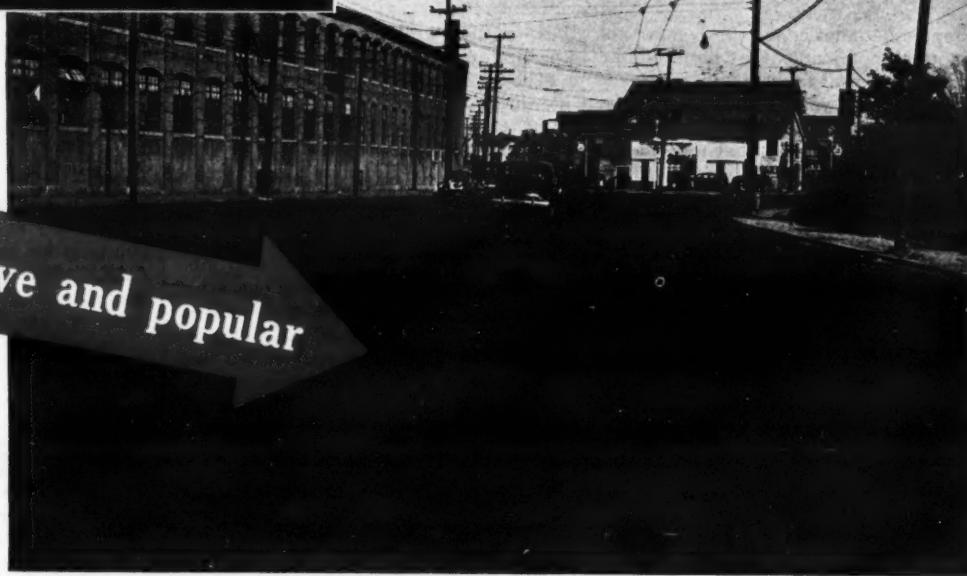


Concrete for the culverts at MacDill Field was delivered in Rex 3-yard truck-mixers on Mack trucks. The Lorain 82 dragline on the job doubled as a crane and swung the concrete to the forms in 2-yard buckets.



Your worn, unsightly pavement

Before and after Central Avenue, Pawtucket, R. I., was resurfaced with Texaco Sheet Asphalt by the Rhode Island Highway Department. Contractor: Campanella and Cardi, Providence.



becomes smooth, attractive and popular

## when resurfaced with resilient, heavy-duty Texaco Sheet Asphalt

One legacy left us by the war is a staggering mileage of worn streets and highways. Your quota of these rough, unsightly pavements, however, does not have to be replaced by expensive new construction. As demonstrated once again by the Rhode Island Highway Department, these pavements usually provide excellent bases for resilient, heavy-duty Texaco Asphalt surfaces of the Sheet Asphalt or Asphaltic Concrete type.

On the important Pawtucket thoroughfare shown above, Rhode Island has constructed a Texaco Sheet Asphalt pavement, consisting of a 1½-inch binder

course and 1-inch wearing surface.

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# Contractors and Engineers Monthly

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## Remember September

September marks the anniversary of two great hurricanes that battered the northeast coastal area of this continent eight and two years ago respectively. The ninth month of the year is usually characterized by autumnal equinoctial storms. They generally occur as the sun reaches a point where the ecliptic and celestial equators intersect, causing day and night to be of equal length all over the world. In 1938 and 1944, September hurricanes gathered momentum in the doldrum latitudes far out in the Atlantic, east of the West Indies. They began moving slowly north and west in the general direction of Cape Hatteras. What happened after that is all too well remembered. The winds did not follow their customary great circle route into the North Atlantic, where they normally dissipate their energy over the watery wastes. Instead they smashed up the coast to leave death and destruction in their wake.

By now, the hurricanes' disastrous effects on physical property have nearly all been corrected. But the more or less permanent changes wrought by the action of wind and wave on mainland and coastal topography have not been erased, nor will they. This is particularly noticeable on Long Island, which projects east from New York City 120 miles into the sea and is located squarely across the path of the two big blows. Water and sand have been shifting the long but narrow barrier reef off the south shore of the island since it was first raised out of the deep eons ago. And these storms augmented that erosive action.

About the only known benefit that resulted from nature running berserk was the opening up of new inlets in the coastal barrier. These passages admitted the waters of the ocean into those of the bay at Moriches and Shinnecock. They increased the salinity of the bay water. And this, in turn, resulted in a marked upswing of the fishing and claming industry which boomed business in many a Long Island town and village. Inlets do not remain in one place, however, as Long Islanders well know. Fire Island Inlet, for example, is one of the principal connections to the sea. According to authentic surveys dating back to 1825, it has been moving west an average of 200 feet a year as the sands of Fire Island beach have been pushed along under continual wave pressure. This movement was halted in 1940 when the Army built a jetty to stabilize the inlet. Similar works to arrest possible migratory trends at Moriches and Shinnecock inlets have been requested of the Federal government. Stabilizing the location of these inlets will aid navigation and provide a haven for small craft during storms. It will also help in beach-erosion control, which has gotten off to a good start this

year with a well planned program by the State of New York.

The State realized that without its aid, local communities—counties, cities, towns, and villages—would be up against it. Alone, they could not begin to cope with the financial and physical aspects of an erosion-control program large enough to protect the lives and property of their residents, and the natural heritage of their beach fronts. Accordingly, a Joint State Legislative Committee of both Houses made a careful and detailed study of the situation. It met last year and recommended that the State finance half the cost of a \$2,000,000 program, with the remainder being paid by the local governments. The recommendation was adopted by the Legislature. This year the erosion-control program is being pushed with vigor by the New York State Department of Public Works and the Long Island State Park Commission.

Already a new channel has been dredged in Fire Island Inlet, where navigation had all but stopped because of excessive shoaling. Strong rock jetties are under construction at Long Beach to prevent further erosion, and to help build up a beach which has been narrowed down, exposing valuable property to loss or damage. Several sections of beach front have also been restored by filling them in with sand pumped from the bay by hydraulic dredges.

New York State has acted with promptness and energy, in this first post-war construction season, to fortify its coast line against further depredations of wind and wave, and thereby protect the lives and property of its people. It serves as a good example to other states with shore lines subject to erosion. Local communities without sufficient funds should not be left to shift for themselves in such matters. They often adopt inadequate protective measures which are not only ineffective, but in many cases do more harm than good. A comprehensive plan, coordinated with sound design, to cope with the particular problem will help lessen the loss should nature again burst out of bounds, in September or whenever.

### Turn In Your Scrap

An appeal to all industries for immediate help in relieving the acute shortage of iron and steel scrap is being made by the American Iron & Steel Institute.

Both production and dormant scrap are needed—the latter includes obsolete equipment, tools, parts, etc. Everyone who is anxiously awaiting steel or machines made of steel can speed up steel production and therefore deliveries by turning in all available iron and steel scrap.

## Construction-Equipment Prices Show Advance

Prices of construction machinery advanced about 6.3 per cent during the second quarter of 1946, the Bureau of Labor Statistics has announced. Since the end of the war, they have risen about 10 per cent, as compared with an increase of less than 0.5 per cent from beginning to end of the war.

During the second quarter of 1946, higher quotations were reported in each month. And in June, construction machinery was selling for about 22 per cent more than in August, 1939. Air compressors constituted the only class of equipment that did not rise in price during the quarter; it remained at a figure about 2½ per cent below pre-war levels.

Drilling and boring equipment, which remained constant in price from August, 1939, to last March, jumped 11.3 per cent. Other groups which rose more than the average were track-type tractors, 9.5 per cent, and material-processing equipment, 6.7 per cent.

Since August, 1939, increases of 20 to 32 per cent have occurred in the prices of track-type tractors, material-processing equipment, specialized construction machinery, and power cranes and shovels. Tractor-mounted equipment; mixers, pavers, and spreaders; and scrapers and graders have advanced from 15 to 18 per cent.

The story at a glance: To every \$100 you paid for construction equipment in August, 1939, you had to add the following amount if buying similar equipment in June, 1946:

Tractor-mounted equipment	\$17.90
Specialized machinery	20.10
Material mixers, pavers, spreaders, and related equipment	15.50
Material-processing equipment	27.50
Power cranes, draglines, shovels, and related equipment	20.30
Scrapers, maintainers, graders	15.20
Drilling and boring machinery	11.30
Track-type tractors	31.80

But for every \$100 spent for portable air compressors in August, 1939, you had to put out only \$97.60 last June.

## Research Board Meeting

The Highway Research Board of the National Research Council will hold its 26th annual meeting, December 5 through 8, at Washington, D.C. Sessions will be held at the building of the National Academy of Sciences and the National Research Council, Director Roy W. Crum has announced.

GET OUT AND STAY OUT!!



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## 1946 Road Building

### To Be \$715,000,000

Despite shortages of material, equipment, and personnel, the nation's highway construction is forging ahead on all fronts, the American Road Builders' Association reports. The program now totals \$400,000,000, says Charles M. Upham, Engineer-Director of ARBA.

Estimated state and Federal-Aid programs to be placed under construction this year will bring the total to \$715,000,000, ARBA expects. With some of the current bottlenecks removed in coming months, it seems safe to predict an even more marked increase in highway building in 1947.

Having \$39,000,000 worth of road work under way, Pennsylvania leads the nation. Of this, \$35,000,000 is expected to be finished this year. California is building \$32,000,000 worth at present, and plans \$75,000,000 for the entire year, to be spent at the rate of \$2,000,000 a week. New York reports \$30,000,000 under construction, and Texas \$28,000,000.

"Year after year of sustained road building is an absolute necessity", Mr. Upham says, discussing the highway future. He reminds us that only 49 per cent of the nation's 1,928,000 miles of county and local roads have all-weather surfaces, and only 73 per cent of the 304,000 miles of urban roads have surfaces of concrete, asphalt, gravel, or stabilized earth.



## 50% THE INVESTMENT IN ONE APPLICATION!

**INCREASE BY DAYS**  
**the LENGTH of YOUR**  
**ROAD SEASON**  
**BUILDING**

## THE SEAMAN MIXER

THE SEAMAN MIXES  
 EXCELLENTLY IN  
 TEMPERATURES  
 AS LOW AS 35° F.

Sudden rains can create serious trouble when, at critical stages of road construction, — the moisture content of aggregate is raised excessively... Dehydration of such material may cost many thousands of dollars in manpower, time and equipment.

... But NOT when a SEAMAN MIXER is on the job. Operating with the hood open, the spinning tines throw the aggregate through the air, in a long arc behind the machine. The consequent aeration and dehydration is remarkably efficient... Many contractors report a 50% reduction of excess moisture in the first pass of the SEAMAN. Two passes often make the aggregate acceptable.

### SOIL STABILIZATION METHODS

Write for your copy of the new, entirely revised and amplified edition of "Soil Stabilization Methods", — Ask for Bulletin E-26.



Hood open, the SEAMAN reduces excessive moisture in aggregate or aerates solvents in a bituminous mix to hasten set.



The SEAMAN produces a higher daily output of uniformly, thoroughly, and intimately mixed material.

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**SEAMAN MOTORS, inc.**

A characteristic first discovered in the northern areas, where at best the road construction season is short, the SEAMAN MIXER produces a highly successful, uniform bituminous mix with excellent control of voids in temperatures as low as 35° F.

The reason? Apart from the efficient and positive mixing action of the tines, it seems highly probable that, friction developed by the high velocity of the tines in contact with the material, raises the temperatures of the mix to the point where it is workable.

One highway engineer in Wisconsin reports he obtained 30 EXTRA days of work because of this SEAMAN advantage!

So, — in any area where low temperatures are a factor, — you can greatly increase your road building season — with the SEAMAN.

C-23

# Dredge San Diego Digs Destroyer Base

**Powerful Dredge Assigned  
To 2,600,000-Yard Project  
In West-Coast Harbor;  
Handles 40,000 Yards a Day**

By RAYMOND P. DAY,  
Western Field Editor

♦ NATURE did not create San Diego Harbor. It merely gouged out a sizable gap in California's smooth coastline there, and left its deepening to west-coast dredgemen. They have struggled with it ever since.

Abrasive bay sand has worn their cutter blades and eaten holes in pump liners. Many a dredging superintendent has worked late at night figuring the shortest discharge for this big bay, where 10,000-foot pipe lines are not uncommon. Wind, shifting tidal currents, ground swells, and even old rusty anchors lost long ago, are man-sized problems.

But the dredgemen are fighting a winning battle now, for more ships enter San Diego Harbor these days than ever before. Where reefs once lay exposed at low tide, open water now floats light-draft boats. It is all part of a very large and successful project, in which every cubic yard dredged is like another rivet in the construction of a bridge.

Many million cubic yards have been dredged from San Diego Harbor by the Case-American Construction Co. of San Diego. Recently the firm finished a 22,000,000-cubic-yard contract, one of the largest dredging jobs ever to be awarded to one contractor on the Pacific coast. With that job done, the firm moved over to Area V, near the Destroyer Base. There it removed 2,600,000 cubic yards of sand, clay, shell, silt, and rock, under similar conditions.

The same dredging plant was used: the 30-inch hydraulic dredge San Diego, with approximately 12,000 linear feet of available pipe line; the tug Malicious; and an anchor scow for moving the dredge swing anchors. Dredging started in Area V on February 16, 1946, and was completed by late May. The area was dredged to minus 25 feet, with one foot of allowable over-depth removal.

Much of the material handled in Area V had been previously dredged. It was a mixture of everything from silt to boulders, with plenty of abrasive sand and shell present. Years ago a dam burst up in the hills behind San Diego, and the outrush of water washed a great amount of quartz-like sand into San Diego Bay. Bay currents have so distributed it that now it is almost im-

possible to take a dredging contract without encountering this abrasive material.

In the big job which the San Diego finished, this sand was successfully pumped at an average rate of 30,000 cubic yards a day by following a 6-day work-week schedule and putting the dredge back in shape on the seventh day. Barium welding rod was used on cutter blades to combat wear, and Ranite B welding rod was used to patch thin places in the pump-liner plates. For the main-shell liner, cast-iron rod did the trick. The big job amounted to a total of some 14 miles of 300-foot cut, which is the width of the San Diego normally cuts.

## The San Diego

The San Diego was built at South Milwaukee, Wis., in 1939, by the Bucyrus-Erie Co. for Martin Wunderlich and the Minneapolis Dredging Co. of Minneapolis, Minn. She pumped the hydraulic fill at Kingsley Dam near Ogallala, Nebr., helped by her sister dredge, the 30-inch Nebraska. When a flurry of wartime preparation hit the west coast, Case-American purchased the San Diego at Kingsley Dam, loaded the dredge with its machinery on 57 freight cars, and shipped it to San Diego, Calif. The dredge was reassembled in the Case-American yard, and 50 feet of additional hull was installed at that time, giving the dredge a steel hull 175 feet long, 40 feet wide, and 10 feet deep. Under normal digging she draws about 5½ feet, with 4½ feet of freeboard.

Several other small changes also were made to increase her digging efficiency under local conditions. In order to prevent her ladder from dragging on shallow digging, a 15-degree bend was put in it about a third of the way in from the cutter end. The length of her ladder is now 95 feet from cutter to trunnion, and the total weight of the ladder assembly is 120 tons. Her spuds were shortened by 20 feet. At the present time they are 70 feet long x 40 inches in diameter, and weigh 29.6 tons. A 30-inch Fort Peck dredge pump was installed, along with a McTaggart cutter, and the dredge has been working continuously ever since. She is one of the most powerful and efficient dredges on the west coast today.

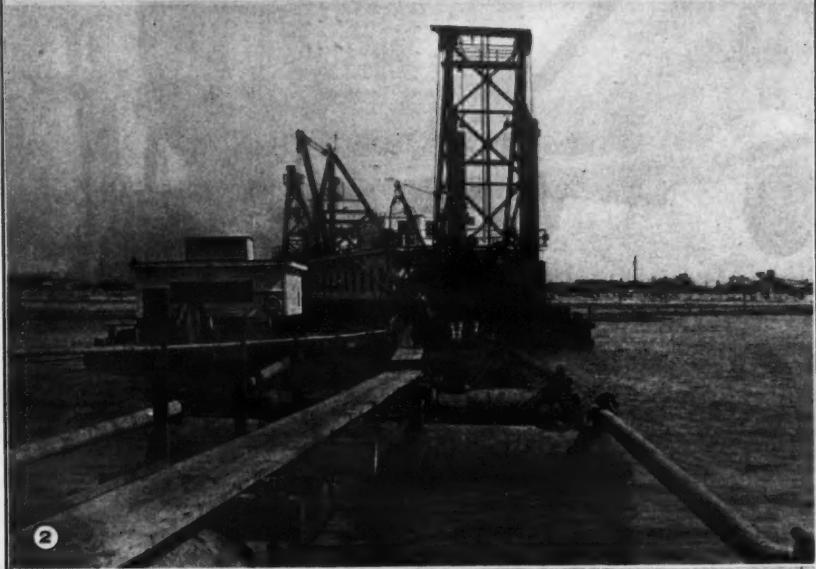
The McTaggart cutter, which works well in San Diego Bay, was originally designed by Jim McTaggart of the Case Construction Co. The revised cutter, consisting of five cutting blades fastened to the front hub, has no rear framework or bracing. It is suited to

(Continued on next page)

1. The 30-inch hydraulic dredge San Diego, owned by the Case-American Construction Co., has removed millions of yards of material from San Diego Harbor. 2. This stern view shows the extra spud well, in the center. With the starboard spud in this well, the dredge can move ahead with the cutter in either corner of a 300-foot-wide cut. The red barge which serves the electrically operated San Diego is seen at the left. 3. The floating pipe line in 50-foot sections is connected by Mobile Pulley & Iron Works joints and supported by pontoons, two to a section. 4. Project Superintendent Dan Gridley (left) and Dredge Captain R. L. Frankland inspect a worn cutter. Each blade on this McTaggart cutter is secured by only four bolts. 5. Worn cutter blades and pump-liner plates were built up at the contractor's dredge yard for return to service. Here two welders work on a Fort Peck pump runner. A pump casing and a stern swivel are shown in the background. 6. This fast speedboat furnished transportation across San Diego Bay between the dredge and Case-American Construction Co.'s Coronado office. C. & E. M. Photo



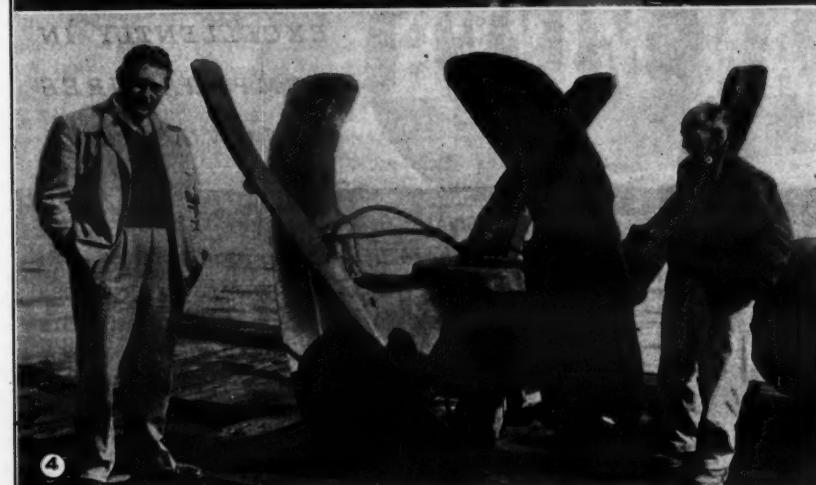
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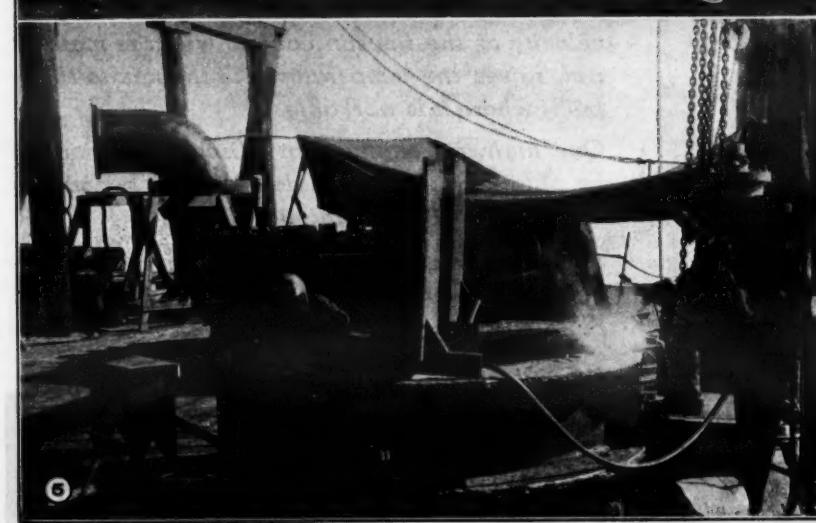
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4



5



6

# Dredge San Diego

(Continued from preceding page)

the sand or other softer material in San Diego Harbor, and will remove hard formations as well, without causing excessive vibration of the dredge.

The suction intake of the San Diego has been extended at a full 34-inch diameter all the way into the main pump. The suction end of the intake pipe is one of the most important things on the dredge. There is a definite relationship between its location and high output. The tip of the flared bell at the end of the intake pipe is kept just even with the back of the cutter blades. This is done on the theory that unless dislodged material finds the easiest possible way of getting into the suction intake, much of it will be lost.

## Operations at Destroyer Base

The job at the Destroyer Base was set up so that light silt and fine material would be available when the longest pipe lines had to be used. The heavier clay balls were pumped over a short line. The average distance from the job to the dump ground was 7,500 feet, with a maximum distance of 10,000 feet in the case of some of the lighter material. The spoil was disposed of in a swampy creek about a mile south of the shore connection. Deepening the anchorage of the Destroyer Base was the primary purpose of the job; spoil disposal was secondary.

Some of the dredging on which the San Diego has been engaged has been in a shallow bank, where a single swing would give the proper depth. Under those conditions, spudding ahead is a source of lost time, for under ordinary conditions the dredge must swing back somewhere close to the center line of the cut in order to make its forward move.

The stern spud gantry was therefore altered very slightly, and a spud well was fastened to the stern framework near the deck level. Its distance was carefully calculated, and it was so placed as to give an advance of 5½ feet if spudding were to take place in the corners of a 300-foot cut. This third spud well came approximately halfway between the spuds as they originally existed. By moving the starboard spud in to this new keeper, and re-rigging the hoist cables which controlled it, the dredge no longer had to swing back empty for spudding purposes. She made her step with the cutter in either corner, and dug on either spud when it was down. It was this innovation which made it possible for the San Diego to advance 1,030 feet over a shallow bank in a 24-hour period, and pick up 40,000 cubic yards of silt while moving.

## Dredge Machinery

The electrically operated San Diego took power from the San Diego Gas & Electric Co. at 11,000 volts. This power passed through 5,300 feet of submarine cable to a reel barge at the stern of the dredge. It was reduced to 6,600 volts by a transformer bank on top of the dredge. Power at 6,600 volts drives the main pump. The other auxiliary motors take their power at 440 volts, and there is a 110-volt lighting circuit.

The main pump, of the Fort Peck type, is driven by a General Electric 4,000-hp motor through a flexible steel coupling. The outboard end of the motor shaft is supported by a Kingsbury pressure-lubricated thrust bearing. The pump runner shaft is supported by a Bucyrus-Erie floating bearing, also pressure-lubricated. Oil is furnished to these bearings by two U.S. ¾-hp motors, each driving a ¾-inch Brown & Sharpe pump.

The 10-inch cutter shaft is turned at 19½ rpm by a 500-hp General Electric motor, through a shop-built gear-

reduction box. The gear-reduction ratio is 503 to 19½. A Cutless rubber bearing supports the shaft at the cutter head, and a pressure head of water on this bearing keeps it free of grit.

The swinging and winding gear is all Bucyrus-Erie-built, and is driven by an Allis-Chalmers motor through a Falk HCFT gear-reduction box, with a gear ratio of 720 to 2.87. The drums are all of large diameter, sturdy in construction, and so mounted that leads are direct with no fleet angle. For swinging, ladder hoist, and spud hoist, 6 x 19 preformed Lang-lay wire rope is used.

Two Allis-Chalmers and a General Electric 75-hp motor each drive 6-inch Allis-Chalmers centrifugal pumps of 750-gpm capacity. Two of these pumps are constantly in use when the dredge is running; the other is a stand-by. The pumps furnish water under pressure to the Cutless rubber bearing and the stern swivel, and remove water from the bilge.

There is also a 440-volt auxiliary

(Concluded on next page)



AD 164

Everybody has commented on the really beautiful four color illustrations contained in the VICTOR Bulletin Form 20 . . . it covers fine welding and cutting equipment . . . it will be yours, free, for the asking. Write us today for your copy.

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# the NEW LIDGERWOOD Torque Converter Equipped Hoist

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Views of the Lidgerwood Torque Converter Equipped Hoist shown with Maxim Silencer for use in restricted areas.



Powered by a husky Diesel or Gasoline engine that cannot stall when under load, this hoist gives you all the smooth, flexible control you've obtained in the past with steam hoists—with the important added advantages of greater economy and lighter weight.

Designed, built and tested by Lidgerwood, this compact hoist is another example of modern design that stems from 72 years of leadership in manufacturing hoisting equipment.

Let this better hoist put your heavy loads on the spot. You may order it built in sizes from 75 H.P. to 150 H.P. or larger.

- Principal Features:
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- At 210 feet per minute
- All Steel Construction
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**H**ere's a new and advanced type hoist that makes light work of many heavy load lifting tasks for industry! It is especially suitable for setting steel in buildings, on bridges, or on many other construction and industrial jobs. Its remarkable flexibility and responsive speed literally "floats" loads into place.

The simplicity of this Lidgerwood Torque Converter Equipped Hoist makes light work of operation, too. For it offers 100% speed and load control by a single lever.

**LIDGERWOOD**

ESTABLISHED 1873

Manufacturing Company

# Dredge San Diego

(Continued from preceding page)

power set, consisting of a Caterpillar D17000 engine driving a 90-kw Louis-Allis generator. A Fairbanks-Morse 4½-kw set furnishes auxiliary 110-volt power for lighting.

#### Floating Line

The joints of her floating pipe line were made by the Mobile Pulley & Iron Works. Her floating line is stretched, in 50-foot sections, behind the dredge. Floating pipe-line sections are supported in cylindrical steel pontoons, two to a pipe section, and braced with 12 x 12-inch strongbacks made of Douglas fir. The shore pipe is in standard 20-foot sections, with slip joints. A plank catwalk, built on one side of the floating pipe sections, accommodates the deckhands who have to walk the line. A crew of only 44 men on the dredge and 26 on the fill takes care of the 3-shift dredging.

#### Taking Care of Repairs

The San Diego has an excellently equipped machine shop aboard, where some repair work is done. Among other things the shop has a Mueller radial drill press, a 24-inch Bridgeford lathe, an Acme 2½-inch threading machine, an Ingersoll-Rand 2-stage air compressor, a 200-ton hydraulic press made by the chief engineer, and three Lincoln welding machines.

Project Superintendent Gridley insists on cleanliness. The San Diego certainly reflects that policy, for it is without a doubt one of the cleanest dredges now operating anywhere. It is scrubbed down every day. It is painted with white enamel, trimmed with green, and its engine room is spotless.

When work is necessary inside the hull, on the pump or one of the other machines, the "mess" is cleaned up pronto. The main pump is lifted out through a roof skylight by a crane every two weeks, and replaced with another pump. The change-over requires about seven hours.

Case-American Construction Co. owns five Fort Peck dredging pumps, which it rotates in use. One of these pumps is kept ready for use, in a built-up condition, at all times. All work of relining pumps, building up the impellers, and so on, is done in a central dredge yard across the bay from the job. It was only a ten-minute run by speedboat from the job across the bay to the fashionable Strand at Coronado, where Gridley's office is located.

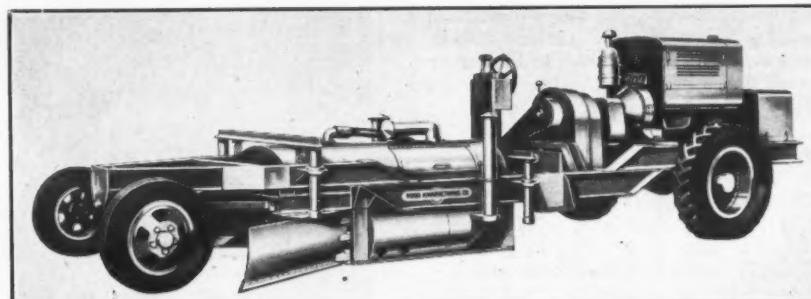
#### Personnel

In addition to Project Superintendent Dan Gridley and Dredge Captain R. L. Frankland, Charles Kucera is Chief Engineer and electrician aboard the dredge.

The project was supervised by the Los Angeles District of the Army Engineers, with Colonel R. C. Hunter in charge as District Engineer.

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The latest addition to Wood road-building equipment is the Roadmixer Model 36—a self-propelled traveling mixing plant with a capacity of 100 to 150 tons per hour.

#### One Man Operates Mobile Mixing Plant

A highly maneuverable model has been added to the Roadmixer line by Wood Mfg. Co. The unit is Model 36, described as a self-propelled, pneumatic-tire-mounted, traveling mixing plant that is operated by one man.

Designed for small jobs, the machine also is said to have sufficient capacity

for larger jobs. Soil-cement, tar, cut-back asphalts, and emulsified asphalts are mixed in one pass. Model 36 handles windrows up to 4 cubic feet, and produces 100 to 150 tons of ready-to-spread mix per hour, Wood claims.

This maneuverable unit has a range of five speeds, from 2 to 14 mph, forward or reverse. It has five mixing speeds also, from 11½ to 71 fpm. In addition, the new unit has the features

of other Wood Roadmixer models—hydraulic steering and lifting, and a compressed-air fuel-oil burner system.

Full details about the new Roadmixer are contained in a bulletin which the Wood Mfg. Co. will send on mention of this report. Write the firm at 6900 Tujunga Ave., Box 620, North Hollywood, Calif.

#### Bulldozers Described

New additions to the Caterpillar earth-moving family, the firm's two angling-type bulldozers, are described in a broadside just issued. The blades are tailor-made for use with the D8 and D7 diesel tractors.

Such design characteristics as balance, visibility, speed of handling, box-section blade construction, moldboard curvatures, trunnions, and specially designed sheaves are detailed in the bulletin. Copies can be obtained by addressing the Caterpillar Tractor Co., Peoria 8, Ill. Ask for Form 9356, and mention this notice.

**Chicago's New - Filtration Plant** *79th Street and the Lake Front*  
**USED Servicised:** **Para-Plastic** *JOINT SEALING COMPOUND.*

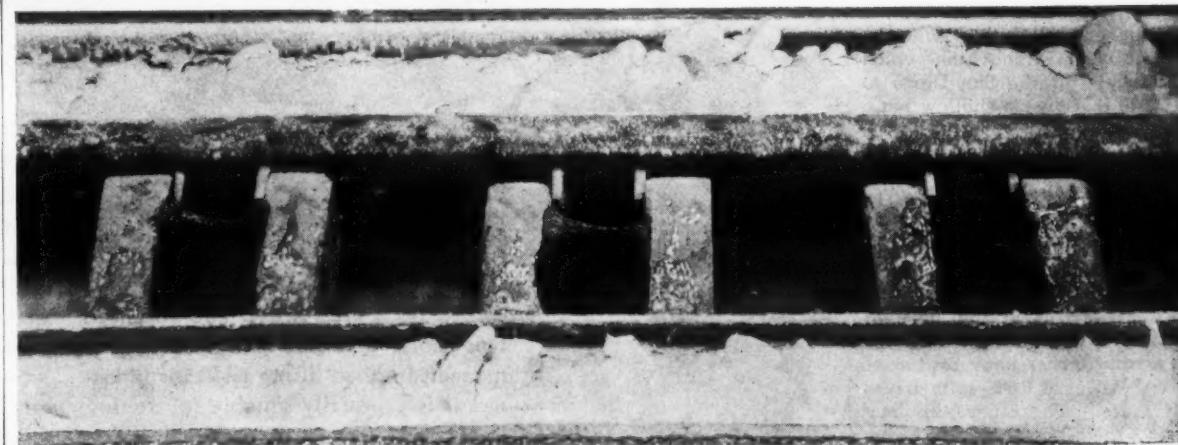
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**PARA-PLASTIC:** is Waterproof, Extendable and Maintains Bond — through all Temperature Variations down to Subzero Weather

The massive concrete chambers of the South Side Filtration Plant in Chicago pictured above are free to move (as all concrete structures must with temperature change and settling) without danger of leakage or foreign matter getting into the purified water. To a large extent this is made possible by the use of Servicised Para-Plastic compound to seal the joints in the structure, so that regardless of movement they stay sealed. In addition, Servicised furnished the premolded, resilient, non-extruding joint filler which was made to meet Federal Specifi-

cations HH-F-341. In general, we recommend for use on all concrete construction required in connection with either water works or sewage treatment, Servicised Cork or Self-Expanding Cork Joint Filler combined with Servicised Para-Plastic Joint Sealing Compound for a perfect job.

Para-Plastic is scientifically made to meet all needs for waterproofing concrete joints and is given numerous tests in our laboratory prior to shipment. One of these tests is pictured below.



The above view showing the "Bond Test" gives only a small interior section of a large specially constructed Freezing Unit with powered "separators" where hundreds of small samples of Para-Plastic are tested for Bonding Power and Extensibility at 0°F.

Para-Plastic is applicable for a great variety of uses: besides being a hot pouring compound it is also made into a number of

premolded forms. The wide classification of Expansion Joints makes it important that the right joint material and form be selected in each instance. There is not a better guarantee of safety for your investment than this assurance. SERVICISED Laboratories and Engineering Departments are ready at all times to assist with your joint sealing problems and to offer recommendations gratis on the basis of experience gained in this field during the past 25 years.



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**Off-the-Highway Tires**

The pneumatic tire has played a big part in the success of America's past construction, and it promises increased use in the work to come. The development of such tires and the special types needed for various off-the-road duties are discussed by The Firestone Tire & Rubber Co. in a new 92-page booklet.

In addition to describing the Firestone line, the booklet devotes much

space to hints on the reduction of hauling costs. Tables give the weights in pounds per cubic yard of various materials which contractors haul; they also recommend loads at various inflation pressures for all tire sizes. The proper Firestone sizes to use are listed in another table according to the make of the equipment.

Catalog C-609 can be obtained from The Firestone Tire & Rubber Co., Akron 17, Ohio, on mention of CONTRACTORS AND ENGINEERS MONTHLY.

**Steel-Piling Manual**

Formed by the cold-rolling process, Corr-Plate corrugated steel piling is described in a new catalog available from the Caine Steel Co. The cold-rolling process makes the corrugations and strength of Corr-Plate uniform throughout, Caine says.

Sectional details, diagrams, suggestions and recommendations, installation instructions, dimensions and weights, and other information fill the illustrated

20-page booklet. Copies can be obtained on mention of this notice. Write the Caine Steel Co., 1820 No. Central Ave., Chicago 39, Ill.

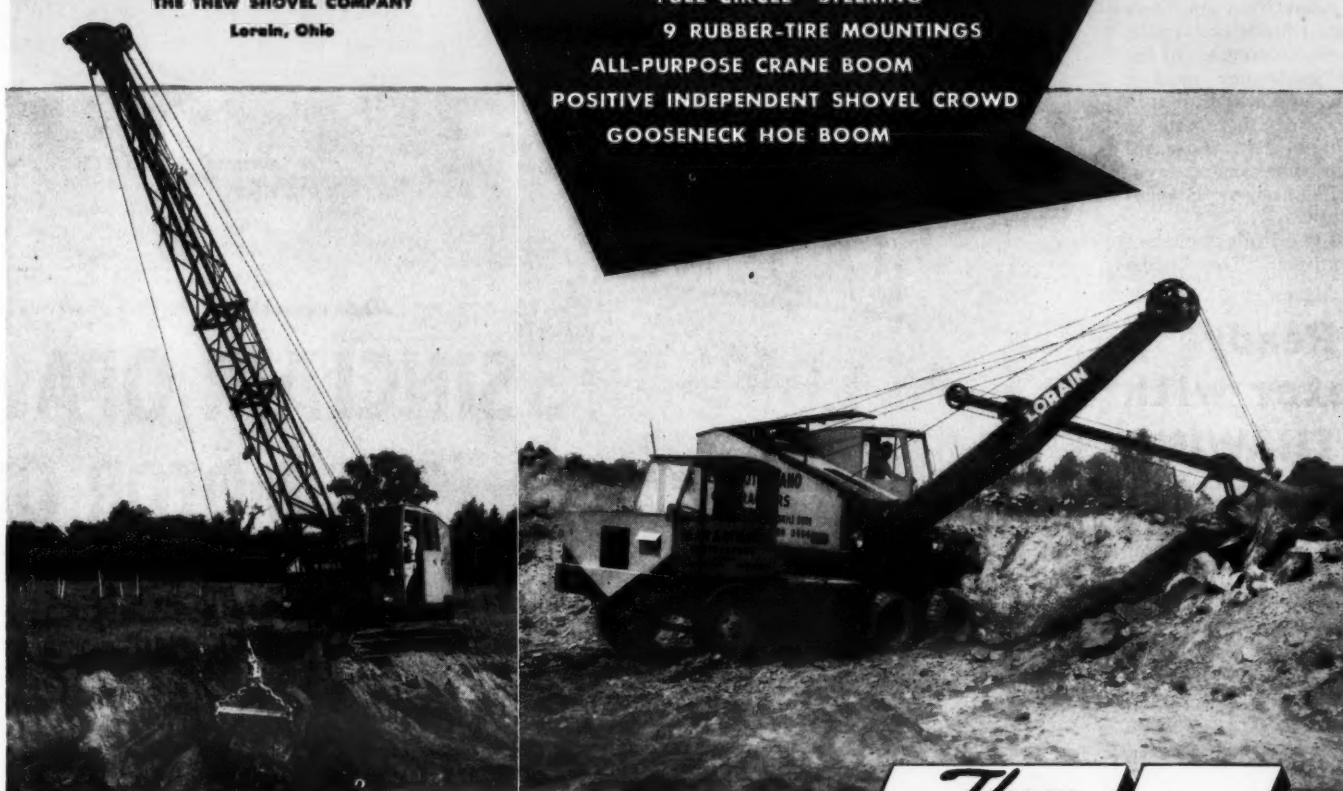
**Roebling Personnel**

Forest S. Burtch has succeeded Earl N. Graf as Sales Manager for the Wire Rope Division of John A. Roebling's Sons Co., Trenton, N. J. He has been succeeded as Sales Manager for the Aircord Division by William Hobbs, Jr.

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# Old Truss Replaced By Modern Structure

**Concrete and Steel Span Has Rock Foundation for Three River Piers; Crane On Each Bank Aids Work**

♦ A 4-SPAN concrete and steel highway bridge is under construction across the Westfield River in Massachusetts. It will replace a 47-year-old Parker-truss span connecting West Springfield on the north bank with Agawam on the south. The Westfield empties into the Connecticut River about 1½ miles to the east of the bridge site. Located in Hampden County, the new Feeding Hills Bridge, as it is known locally, is 334 feet long with two center spans of 100 feet between piers, and two end spans of 67 feet between piers and abutments. Daniel O'Connell's Sons, Inc., of Holyoke, Mass., is building the bridge for the Massachusetts Department of Public Works.

The new structure is being built right alongside the old bridge; their center lines are only 52 feet apart, with the new span on the east or downstream side. In some ways this was a help when material and light equipment had to be moved back and forth, but in another respect it was a hindrance—for instance, during the construction of pier 2. The fact that this pier butted against the single pier in the truss span caused difficulty in unwatering the cofferdam, since considerable seepage came through the only masonry pier.

As the replaced structure was posted for only 6-ton loads, no heavy equipment could be moved across it, and the next bridge suitable for heavy loads is at the town of Westfield, 7 miles upstream. A full day would have been lost in shifting a crane from one bank to another by this roundabout route. So in order to speed the progress of the construction, the contractor used a crane on each side, and was thus in a position to work from either bank as conditions warranted. This foresight was a boon when the varying river stages necessitated some hasty changes in the work schedule.

Side by side the two bridges present an interesting contrast. The 2-span

truss structure is supported on stone-masonry abutments and a center pier. It has a 27-foot plank-deck roadway including an unused trolley track. The new bridge with concrete abutments and three piers will have a steel superstructure; this will support a 44-foot concrete roadway with two 8-foot sidewalks. Work on the new structure started August 1, 1945, and traffic is expected to be using it some time in October of this year. The old bridge will then be dismantled, and the river bank reshaped in that area. New approaches, totaling 380 feet on each side, are also being readied. These require careful planning, since at the south end of the span three roads, State Route 57, U. S. 5A, and a city street all meet at the bridgehead. At the north end two

streets fork off from the span. One route, 5A, goes north through the center of West Springfield, and the other goes past the grounds of the Eastern States Exposition to Springfield.

## Building the Piers

The Westfield River is not navigable, being only a few feet deep as a rule, with the north half generally dry during the summer season. But occasionally the stream goes on a rampage. During the 1936 flood, for instance, it rose from a normal elevation of 40.5 to 65.6. The year 1945 was a wet one in Massachusetts, as well as in many other parts of the country. Its rainfall caused the Westfield to flow full width between its banks, and required the contractor to alter his original plan of constructing the center pier first and to go to work on pier 1, the southerly pier off the Agawam shore.

Foundation conditions are generally ideal over the whole bridge site. Ledge rock lies beneath an overburden of sand

(Continued on next page)



C. & E. M. Photo  
A Bucyrus-Erie steam crane with a 1-yard Owen clamshell excavates for the south abutment of the new bridge across the Westfield River.



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## Old Truss Replaced By Modern Structure

(Continued from preceding page)

and gravel that is not too deep, varying from 0 to 10 feet over the pier sites. There are some strata of hardpan interspersed here and there to lend variety to the digging and to keep the job from becoming too routine an operation. In August the river was as high as it had ever been during that month in the past 15 years. But a wooden trestle was built out from the south bank for a crane to work on while driving the steel sheet pile cofferdam.

A Bucyrus-Erie steam crane with a 65-foot boom and 50-foot leads drove Bethlehem Steel Co. Section M-115 sheeting with a McKiernan-Terry No. 7 hammer. The 150-hp coal-burning boiler on the rig provided ample steam for both the crane operations and the hammer. Because of the sloping ledge rock, the sheet piling varied from 5 to 18 feet in depth. When it was driven, the overburden was removed by a clamshell bucket. When the hardpan was encountered the cofferdam was unwatered by two pumps, a Rex 6-inch and a Gorman-Rupp 3-inch. Then the tough strata were removed with Worthington pneumatic clay spades powered by a Schramm 315-cfm air compressor.

When the ledge rock was reached, enough was removed so that the footings would be surrounded by rock as much as possible where the grade permitted. Their depth ranges from 3 to 11 feet. The ledge was removed by drilling with Ingersoll-Rand and Cleveland air hammers, using 4-foot lengths of  $\frac{3}{8}$ -inch steel with  $1\frac{1}{2}$  to  $1\frac{1}{4}$ -inch bits. The drill holes were spaced on  $2\frac{1}{2}$ -foot centers and charged lightly with 40 per cent dynamite so as not to damage the cofferdam.

The cofferdam was built with 20 x 67-foot dimensions to accommodate the pier footing, which measures 12 x 62 feet with a minimum depth of 3 feet. Inside the cofferdam, the lower tier of bracing consisted of 14-inch steel H-beams. These were left in the footing and later cut off flush with the sides. For the upper ranges 12 x 12-inch timbers were used, cut to size with a Mall power chain saw. Before concreting, the ledge at the bottom of the cofferdam was carefully cleaned with an air and water jet. This was devised by the contractor and featured both air and water coming out of the same nozzle. Force was added to the 1-inch water hose by an air line from the compressor.

### Another Crane Rig

The cofferdam for pier 2, the center pier, was built from the north shore of the river. But first, a dirt work road was built out in the water for the second crane to work from. This rig was a Northwest with a 60-foot boom, and it first had to dig a passage through a river dike with its Williams 1-yard dragline bucket in order to reach the job site. This earth dike had been built along the river by the U. S. Engineers to protect the permanent buildings of the Eastern States Exposition from possible flood damage. Later on, sheet

piling will be driven along the bank to prevent river seepage from going through the dirt levee. It furnished material for the crane to use in building its path out to the pier location. The water was shallower on this side than on the south side, so a timber trestle was unnecessary.

Using the same leads,  $26\frac{1}{2}$  inches between channels, and a driving hammer, the second crane swung the sheet piling into place for cofferdam 2. Steam for driving was supplied from the steam rig on the south shore and brought over the old bridge in a 2-inch line. The construction operations were similar to those used on pier 1, but in this case the new pier butted up against the old one. In fact, part of the old masonry footing occupied a small area required for the new footing. Difficulty was experienced in unwatering the cofferdam because of seepage through the old pier footing, which made up part of one corner of the cofferdam. The problem was solved by augmenting the discharge of water from the 3 and 6-inch pumps

by installing two Cleveland air pumps, both working off the same 315-cfm compressor. The air pumps were placed in the bottom of the cofferdam. Although in this case they were never completely submerged, they functioned just as well if they were, as long as the outlet on the air exhaust line was kept above water. These pumps have two other lines, an air intake and a 2-inch water discharge. When they were placed in a sump hole or water pocket such as in this cofferdam, they needed no further attention and worked as long as the compressor kept running.

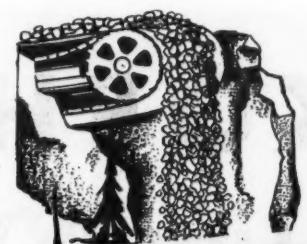
### Form Work

With the water disposed of, form work on the footings was begun. Either 1 x 6 or 1 x 8-inch boards were used, backed by 2 x 6 studs set on 16-inch centers. Double 2 x 6 wales were placed at various spacings according to the pressure, with the closest spacing, of course, at the bottom. The forms were held together with Richmond form ties.

(Continued on next page)



C. & E. M. Photo  
Excavation for Pier 3 was handled by a Northwest with a 60-foot boom and a 1-yard Williams bucket.



IN A STEADY STREAM FROM UNIVERSAL "STREAM-FLO" ROCK AND GRAVEL PLANTS

LIKE A WATERFALL MATERIAL FLOWS

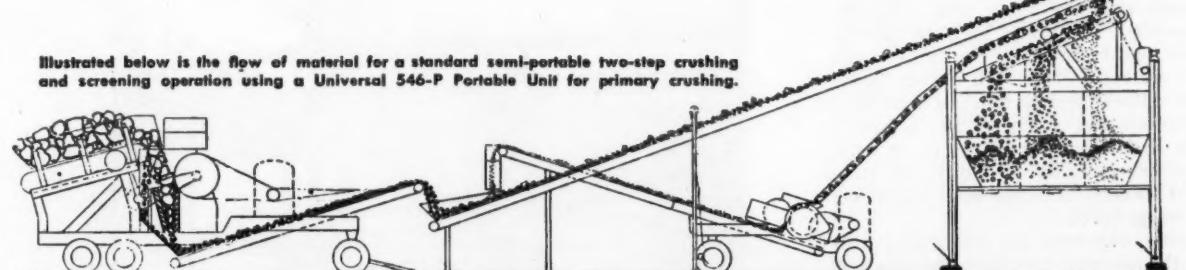


THE UNIVERSAL 546-P PORTABLE PRIMARY CRUSHING UNIT

Built to stand up under high speed production, the 546-P Primary Crushing Unit steps up the output of any secondary crushing plant. It can be used to convert your gravel plant to handle rock, or to increase the efficiency of your rock plant by eliminating sledging or pop shooting of large oversize.

The 546-P provides a steady stream of ideal sized material. When teamed up with a gyrating screen and a Universal Pulverizer, it produces unbelievable quantities of aglime with remarkable economy. Easily moved from job to job, the 546-P meets today's production needs of highest capacity at lowest cost.

Illustrated below is the flow of material for a standard semi-portable two-step crushing and screening operation using a Universal 546-P Portable Unit for primary crushing.



More and more cost-wise operators are profiting with the 546-P. For complete information see your Universal distributor or write for Bulletin No. 56.

**UNIVERSAL**  
ENGINEERING CORPORATION  
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ROCK, GRAVEL AND LIME CRUSHING PLANTS • CONVEYORS  
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GRINDING

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AGERSTRAND CORPORATION  
Muskegon, Michigan

## Old Truss Replaced By Modern Structure

(Continued from preceding page)

For all concrete work above the water level, the forms had to be faced with  $\frac{3}{4}$ -inch plywood. As the plywood came in 8-foot strips, form panels were made up in two sizes which speeded up the form building on the tall piers. The special panels measured 8 x 11 for the pour on the first lift, and 8 x 20 feet for the second lift. All panels had a  $\frac{3}{4}$ -inch rod going through the studs at one end so that they could easily be picked up by the crane and quickly set in place. An International flat-bed truck was used for handling and transporting the form panels about the job.

### Concreting Operations

Truck-mixed concrete for all pours was purchased from the Construction Service Corp., a commercial plant in East Springfield 12 miles from the bridge site. The company delivered the concrete in a fleet of Smith 4-yard mixers, using up to six units depending on the size of the pour. Each of the pier footings took about 180 yards, but while the footings had to be completed in a single operation, the pier stems were done in two lifts of 130 and 50 yards. In mixing, the drums were required to make 70 revolutions which took from 3 to 5 minutes, either at the very end of the trip or after the truck had arrived at the job site. The average round trip from plant to bridge and back again took about an hour.

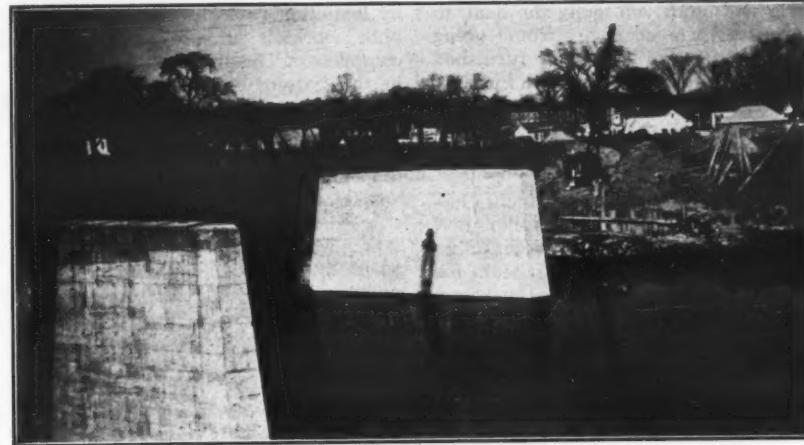
The concrete was delivered to two Blaw-Knox buckets, a  $1\frac{1}{2}$ -yard size for the Northwest crane to handle, and a 1-yard bucket for the Bucyrus-Erie steam rig. The performance of the two units averaged 25 and 16 yards per hour respectively; the average for footing pours was slightly less than this figure. The steam rig worked 13 hours, from 7:45 a.m. to 8:45 p.m., to pour the 180-yard footing on pier 1. The other crane took 10 hours to pour the same amount of concrete on the pier 2 footing.

From the buckets the concrete was fed into the forms through a 14-inch elephant-trunk pipe and held to a maximum drop of 5 feet. At either end of the forms a Master vibrator on a wheelbarrow frame was used to vibrate the concrete in its half of the pour. When the work lasted into the evening, an Onan 1,250-watt light plant with four 300-watt floodlights furnished the necessary light.

After the footing for pier 1 was poured, forms were set for the first lift of the pier itself. But then the contractor, acting on a hunch, changed his mind and hastily set the forms to pour the footing on pier 2. These were ready at 11 a.m. on October 2, when concreting started, and the pour was completed at 9 p.m. That night a heavy rain started and the river rose steadily, compelling the crane to back off the work road before even the forms could be removed. The high water lasted over a week and certainly would have prevented any work on the footing if such had been the plan. As it was, however, work on the No. 1 pier stem could proceed since this pour was above the water level.

Labor was none too plentiful on this job, the average crew being between 10 and 15. More men were brought in from other Daniel O'Connell contracts in the vicinity when they were especially needed for the concrete operations.

The piers rise to heights of 27, 28, and 26 feet respectively above the footings, from the south to the north shore; they are 6 feet wide at the bottom and 4 feet at the top. Their length out to out is 60 feet. On the upstream side a galvanized iron nose was installed on



C. & E. M. Photo

A new 4-span concrete and steel bridge is under construction across the Westfield River at West Springfield, Mass. It will replace an old Parker-truss span, which is shown in the background.

each pier as a protection from ice floes. Projecting 1 foot from the top of each pier and abutment on the upstream side is an I-beam which is connected to the

diaphragm floor beams of the superstructure. This steel tie is designed to prevent any overturning of the superstructure such as happened to several

bridges in the 1936 and 1938 floods. At that time, debris carried by the waters piled up beneath the structure and sheared the spans from their piers.

### Abutments

After pier 2 was poured, the Northwest crane again opened the channel between the pier and bank and started work on pier 3, which is close to the water's edge. No steel cofferdam was required, but a row of sheet piling was driven along the bank to prevent cave-ins, and a few tiers of sandbags were strung out to check the water. Excavation was done by the dragline bucket while the form work and concreting were similar to that of the other two piers. A Vulcan pile extractor was used to remove the sheet piling later on.

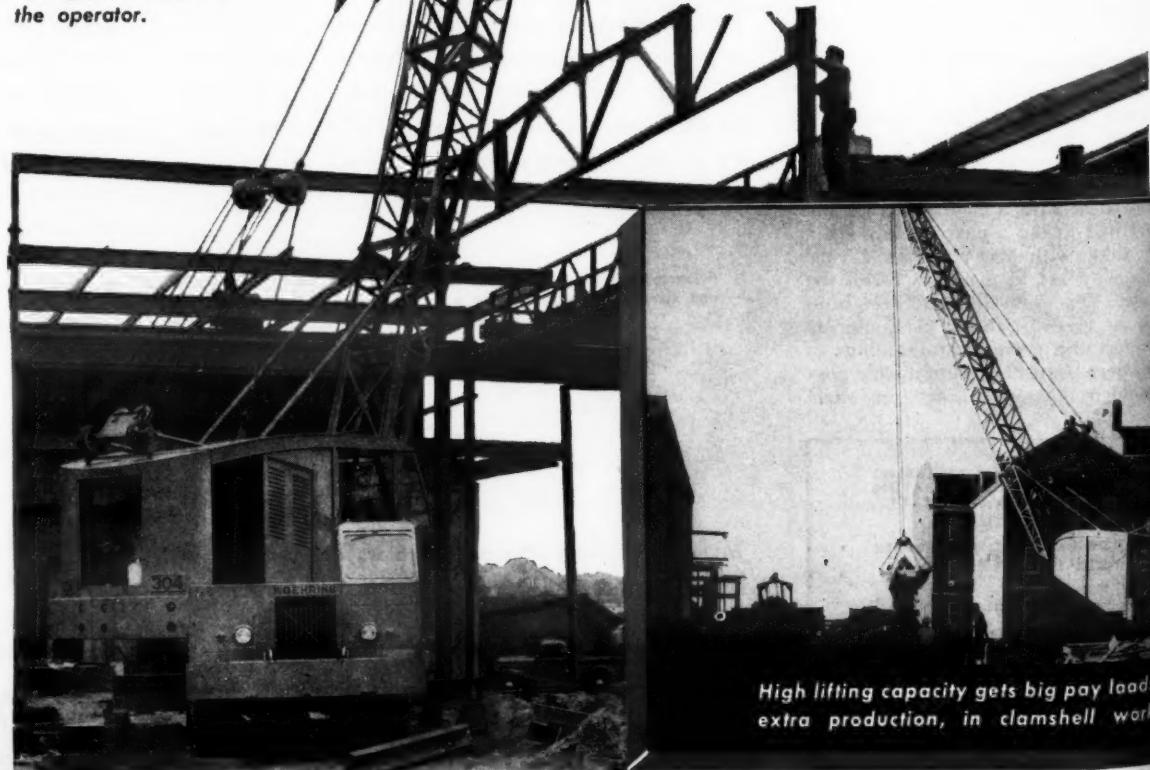
The abutments were then built on the tops of the two banks, supported by steel piling up to 35 feet in length. The piles are 10-inch 49-pound H-beams and were driven by a McKiernan-Terry 9B3 double-acting hammer. The south

(Concluded on next page, Col. 4)

# New KOEHRING Easily Lifts 40,000 lbs.



Excellent visibility—up, front, left, right — makes steel setting jobs easier for the operator.



### C

CHECK the new Koehring 304 Truck Crane, the new Heavy-Duty unit with all the sturdy quality of the Koehring line. The same base machine that makes the Koehring 304 a Heavy-Duty leader in the crawler class is yours on the Koehring 304 Truck Crane. Its extra strength turns added stability gained by truck mounting into extra lifting capacity. With outriggers, you easily lift 40,000 lbs. (85% rating) . . . not only over the end, but over the side and all around. Without outriggers, you lift up to 15,800 lbs.

High lifting capacity gets big pay loads, extra production, in clamshell work.

## Floodlights Speed Swamp Reclamation

Out in the land where they have been doing big things since the days of Paul Bunyan, a big project is now nearing completion. It consists of reclaiming a large swamp area and converting it into fertile farm land. The work is being carried on by the Sadler Bros. Contracting Co. of Danville, Ind., near Gibson, Minn.

Electricity, supplied by an Onan power unit, has contributed much to the rapid completion of this project. A gasoline-powered dragline, mounted on crawlers, has worked day and night for several months, digging a drainage channel 12 feet deep and almost 15 miles long.

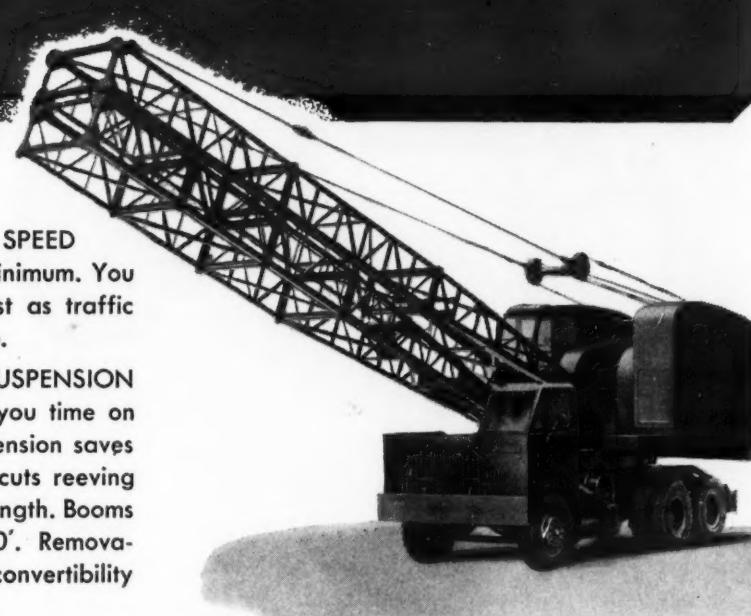
Night operation of the dragline has been made possible by the use of large floodlights. Two were mounted on the cab, and one on the boom. An Onan W3M electric generating plant was installed at the rear of the control cab. It has provided power for the lights, and for operating a number of electric repair



Round-the-clock operation on a swamp reclamation project in Minnesota was made possible by floodlighting the work at night. Onan plants supplied the electricity.

tools. The W3M is a standard Onan model, developing 3,000 watts, 115-volt ac. It is powered by a 6½-hp water-cooled gasoline engine.

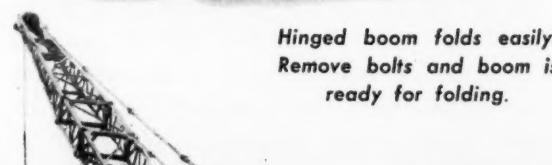
## 304 TRUCK CRANE Travels at Traffic Speed



### YOU ROLL ALONG AT TRAFFIC SPEED

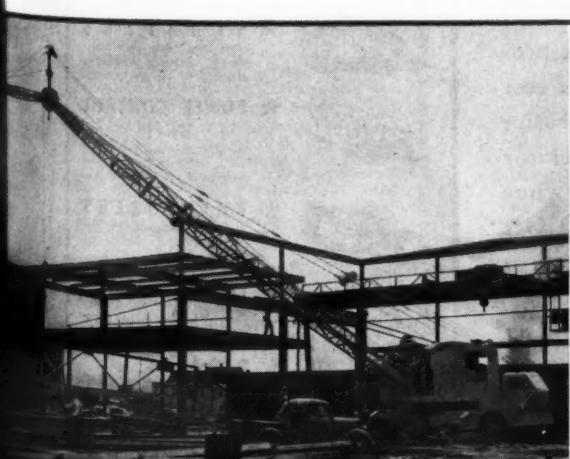
No-pay travel time drops to the minimum. You roll along from job to job as fast as traffic flows. Where trucks go, you go.

**FOLDING BOOM . . . PENDANT SUSPENSION**  
Hinged boom folds easily, saves you time on every move. Pendant boom suspension saves 60% of boom suspension cable, cuts reeling time whenever you change boom length. Booms up to 110'. Jib extensions 5' to 30'. Removable outriggers are optional for full convertibility to shovel, pull shovel or dragline.



Hinged boom folds easily. Remove bolts and boom is ready for folding.

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Smooth, accurate brakes and clutches put steel just where you want it.



Pendant boom suspension cuts cable costs, simplifies changes in boom length.

## Old Truss Replaced By Modern Structure

(Continued from preceding page)

abutment, 72 feet long, required 27 piles, while the 60-foot-long north abutment took 19 piles. Each pile has a minimum bearing capacity of 20 tons. The abutments are 6 feet high with an additional 4-foot curtain wall on top of each.

On the north side along one of the approach fills, a concrete retaining wall had to be constructed, 68 feet long and 15 feet average height, to protect a sewage-treatment plant just east of the bridge. Riprap was placed along the banks before work was started on the superstructure.

### Superstructure

On March 7, the American Bridge Co. began erecting the steel superstructure. It consists of 11 continuous stringers, with 36-inch WF steel beams set 4½ feet on centers. The outside beams are 230 pounds; the inside beams are 160 pounds. The diaphragm beams are placed 16 feet 8 inches on centers, and are 27-inch 91-pound WF members. Each sidewalk is supported by steel brackets with two 8-inch 23-pound I-beam stringers. Over the steel will go a 6-inch reinforced-concrete slab for the 44-foot roadway which will be surfaced with 2½ inches of black-top. The bridge approaches will be given a bituminous-macadam pavement.

### Items and Personnel

The major items on this Westfield River bridge and its approaches, all of which are being built at a cost of \$211,576.94, include the following:

Excavation	7,900 cu. yds.
Concrete	2,280 cu. yds.
Steel reinforcement	152,000 lbs.
Structural steel	1,010,000 lbs.
Riprap	1,300 cu. yds.

This project (FAP 136 D [1]) is in District 2 of the Massachusetts Department of Public Works, of which Cyril B. Raymond is District Engineer, with headquarters at Greenfield. Hugh Corr is Resident Engineer assisted by Wallace Lilley and Walter Forbush. Robert Fischer is Superintendent for Daniel O'Connell's Sons, Inc.

### Compressor-Powered Chain Saw in 2 Sizes

A power saw for many contracting jobs, the Disston chain pneumatic saw, has been announced by Henry Disston & Sons, Inc. Built to cut all sorts of timber, including piling under water, this unit is driven by air from any compressor.

Known as the Model P Series, the Disston pneumatic saw is built in two sizes, 24 and 36 inches. These have a heavy-duty vane-type air motor as driving element. The 24-inch model is supplied with either a 3½ or a 5-hp motor, and the 36-inch with a 5-hp unit. The smaller motor requires 90 cubic feet of air per minute and the larger 150 cubic feet, at a pressure of 90 psi.

Made from heat-treated steel, the cutting chain is said to cut a minimum kerf. Power is transmitted to the chain through spiral bevel gears. The gear case can be rotated in either direction to 180 degrees. The chain travels in a groove milled in the guide rail, and is tensioned automatically by an adjustable device in the tail stock handle. Adjusting tools, air hose, and coupling are supplied with the saw.

Full details, and literature descriptive of this air-driven chain saw, can be secured by addressing the Power Chain Saw Division of Henry Disston & Sons, Philadelphia 35, Pa. Tell the firm you read this news item.

# Drainage Facilities At Improved Airport

(Continued from page 2)

for the Class B concrete mixed in a Koehring Dandee mixer. Aggregate and cement were weighed on a Fairbanks scale. A very dry-mix concrete was hand-tamped into 27 x 12 x 2-inch steel forms which were pulled immediately. The concrete liners were left to set on an unused section of the runway.

Using only 10 forms, a record of 1,400 individual ditch liners weighing 45 pounds each were cast in one 10-hour day. The liners were laid by hand along the ditch slopes with open joints to facilitate seepage through the sandy soil and to prevent buckling.

The drainage ditches flank the runway, which has a 1 per cent grade from the center line out to the shoulders. Runway drainage is carried to the ditches by catch basins spaced 270 feet apart on the southwest side of the runway. On the northeast side, it is carried to them by a series of inlets with drain lines. In addition to the ditches, the Owens subcontract included laying 22,456 linear feet of concrete pipe varying in diameter from 15 to 48 inches.

## Concrete Box Culverts

There are 8 double 4 x 6-foot concrete box culverts which were poured by the W. C. Shepherd Co. These concrete culverts required 3,472 cubic yards of concrete.

To handle the concrete for the culverts, as well as for 6,000 square yards of ditch-invert paving at both influent and effluent ends of the culverts, Clyde Shepherd set up a dry-batch plant at the site of the field office and yard, not quite 2 miles from the project.

At the plant, a 20-ton Blaw-Knox gravel bin was loaded from flatcars by a Lorain 40 crane. Concrete was delivered to the job by four Rex EH 3-yard truck-mixers mounted on Macks. On the job, the concrete was poured into 2-yard concrete buckets from the truck-mixers and swung into the forms by a Lorain 82 dragline which doubled as a bucket crane. On the best day during concrete operations, 200 yards of concrete was poured during a 10-hour shift.

In addition to the eight double box culverts, there is one double 4 x 6 culvert on the project 680 feet long, a portion of which was built on a 100-foot radius.

The contractor used the same set of forms for all culverts. Culverts were built in 100-foot sections, and only 300 feet of inside forms and 300 feet of outside forms were required on the job. Headwall footings for the culverts follow the slope of the ditches to conserve concrete. Footings are 3 feet 10 inches wide x 10 inches thick, with a 1-foot toe wall.



The largest of the new drainage structures at MacDill Field is a 680-foot-long culvert, a portion of which was built on a 100-foot radius. In this view of a section of the culvert, workmen are placing reinforcing rods.

## Golly, 'Gators!

All culverts at MacDill Field are at very nearly sea-level elevations. One which is located at the Bay side of the

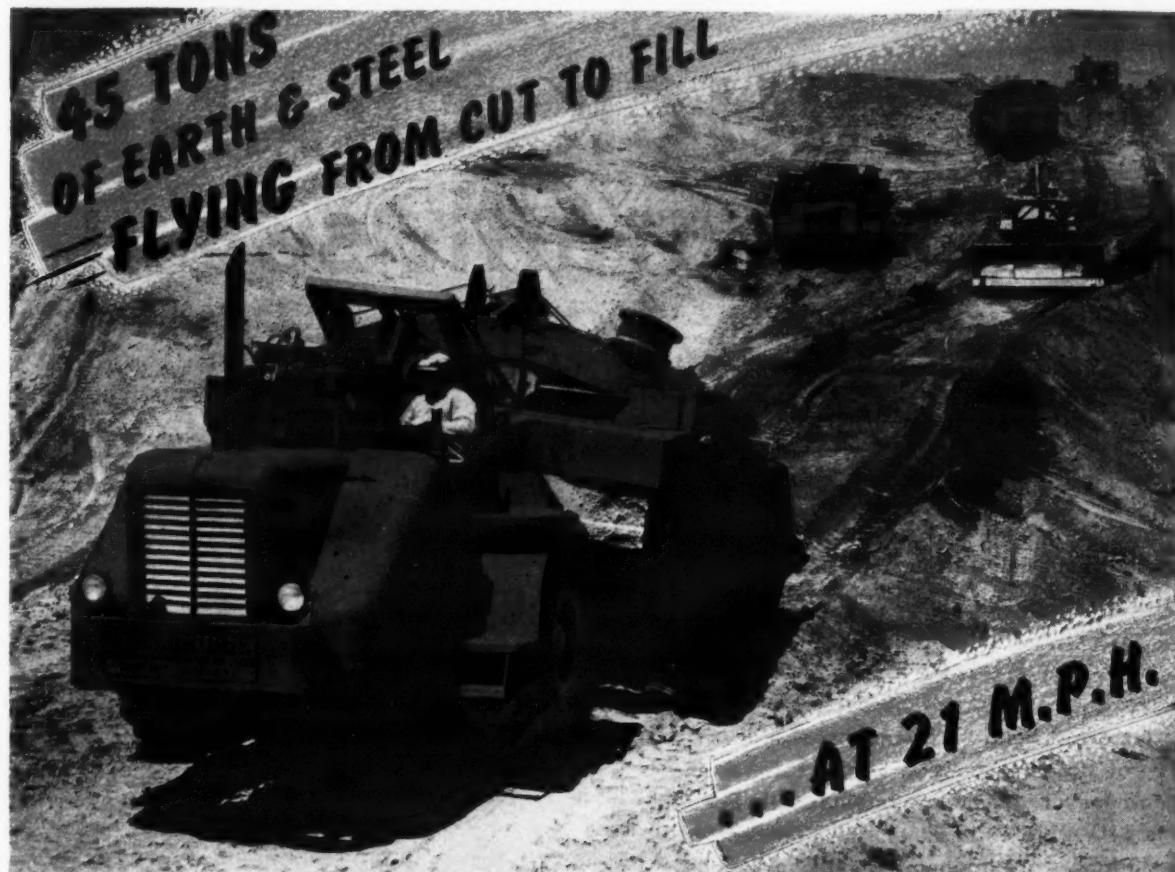
field actually has an invert elevation of minus 0.1 and an invert elevation of minus 0.19. While this particular culvert was under construction, workmen

removing the forms one morning were considerably startled to find a full-grown 6-foot Florida alligator nestled in the cool, dark temporary cave. Cornered and captured, the 'gator was installed in a tank between the field office and asphalt plant. Great plans were under way for making a mascot of the none too gentle pet when he was discovered quite rigid one morning. There were no signs of violence and Clyde Shepherd decided that dust and fumes from the asphalt plant had been too much for the alligator.

A second 'gator which came in with the tide and made his way through the culverts into a low area of the field did not enjoy even the temporary fruits of pampered captivity. He met a quick death before the onslaught of bludgeon-swinging workers whose thoughts were of belts and purses rather than mascots.

## Ditch-Invert Paving

To protect the influent and effluent ends of the ditches at the culverts, the  
(Concluded on next page)



A fleet of TERRA-COBRAS widening Ignacio-Santa Rosa Highway north of San Francisco for Harms Bros., contractors.

Full loads of 18 cu. yds. on this 1800 ft. round-trip haul, trip after trip, are the rule rather than the exception, with Wooldridge Terra-Cobras. Steep climbs to the top of the cut—fast downhill loading—fast break-away and rapid acceleration to top speed contribute to maximum yardage efficiency. Power and speed combined with positive steering control make possible the handling of tons of earth in less time at a lower cost—and with greater safety to operators and equipment. Easier all-around handling of the Terra-Cobra results in less operator fatigue and higher hourly averages. Why not plan to key your earth-moving operations to Wooldridge Terra-Cobras? Get full details, today.

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Economical in cost  
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Available in 1,500,  
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Tractor-drawn for handling heaping yardages from 6 to 28 cu. yards.
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Single and multiple drum with universal or roller fairleads.
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Tough and rugged design for standard makes of tractors.
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Adjustable angle-blades for standard tractor mounting.
- ★ **RIPPERS**  
Available in light, medium and heavy duty models with two sizes to each model.

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## Drainage Facilities At Improved Airport

(Continued from preceding page)

ditch bottoms are paved out for a distance of 75 feet. The Class B ditch-invert paving at the culverts is 4 inches thick and reinforced with 6 x 6-inch 6/6 wire mesh. The invert paving at culverts is to prevent erosion as the water enters and leaves. Ditch bottoms otherwise are of natural soil.

### Timber Bridge

Incidental to the construction of the drainage system at MacDill Field was construction of one timber-bent bridge on an existing airport road over a new drainage ditch. This bridge is 25 feet wide and 50 feet long. It has 12 x 12-inch caps and 4 x 14-inch stringers. Twenty-nine piles, 45 feet long, were driven to refusal for the bridge.

### Personnel

The work on the drainage system at MacDill Field was part of the contract for new construction and reconstruction held by the W. C. Shepherd Co., Inc., of Atlanta, and built under the supervision of the United States Engineer Office at Savannah. C. B. Kneller was in charge of the drainage work for the U. S. Engineers, while Clyde Shepherd, Jr., supervised construction for the contractor.



## ELECTRICITY

For All Contracting and Engineering Projects

ONAN ELECTRIC GENERATING PLANTS supply reliable, economical electric service for engineering and contracting uses as well as for scores of other general applications.

Driven by Onan-built 4-cycle gasoline engines, these power units are of single-unit, compact design and sturdy construction. Suitable for mobile, stationary or emergency service.

CAPACITY RANGE: 350 to 35,000 watts. ALTERNATING CURRENT: 115 and 230 volts, 50 and 60-cycle, single phase for all capacities. Three-phase for models 3 KW or larger. Other voltages and frequencies available.

DIRECT CURRENT: 115 and 230 volts, 600 to 10,000 watts. 6, 12 and 32-volt battery charging types to 3500 watts.

WRITE FOR DETAILED LITERATURE.

D. W. ONAN & SONS

3462 Royalston Ave.  
Minneapolis 5, Minn.



## Portable Field Belt For Aggregate Work

A portable field belt, operated on a sectionized idler system, and an 80-foot lift conveyor are handling some 1,500 tons of sand and gravel daily at the Rubber City Sand & Gravel Co. plant at Akron, Ohio.

Designed and built by the Goodyear Tire & Rubber Co., the conveyor system uses approximately 1,700 feet of 24-inch belting. The 7-ply fabric lift belt used on the job has been in operation nearly five years without any noticeable wear, Hal Knight, Vice President and General Manager of Rubber City, says.

The field belt runs on 580-foot centers. It services a power shovel in the sand pit, and is designed to handle all the sand the shovel will load in continuous operation. The sand is dumped into a screening hopper that eliminates impervious material and regulates the loading of the sand onto the belt. The belt rolls on idler sections that can be shifted to the desired site of operations.



This Goodyear portable field belt rides on sectionized idlers that can easily be moved to the site of shovel operations. The hopper feeds a regulated supply of sand to the conveyor, at the same time eliminating all impervious material.

A second field belt, set up at a 90-degree angle, hauls the material to the lift belt. The lift belt operates on 268-foot centers and is driven by a 40-hp motor. It carries the sand on a 30 per cent grade up the 80-foot tipple to the screening plant, washer, and storage

silos. Trucks are loaded from chutes at the silo bases.

A tire's rated capacity cannot be increased by inflating it beyond the recommended pressure. Increased pressure does not increase tire strength.

There's at least 5 YEARS' DIFFERENCE between ordinary air compressors and the modern Jaeger "AIR PLUS" . . . Engineered as complete units to micro-precision standards unknown before the war, and powered with big Continental, Caterpillar and International engines of the latest type, these efficient machines deliver cooler, drier air with less fuel consumption than any compressor you have ever owned.

In design they are extremely simple and accessible. In operation they develop full efficiency at 20% to 30% slower piston speed than others, eliminating all usual vibration and increasing the life of both engine and compressor. Giant, air-animatized valves, "ultra-lapped" to perfect seating closure, insure free flow and positive delivery of all the air and make frequent valve grinding or replacement a thing of the past.

"AIR PLUS" Compressors are sold and ably serviced in 120 cities. Sizes 60 to 500 ft. Ask your Jaeger distributor or write us for Catalog JC-5.

THE JAEGER MACHINE COMPANY, Columbus 16, Ohio

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You Get MORE FOR YOUR MONEY in a MODERN COMPRESSOR

- Air-cooled, 2-stage, vertical compressor—built in a balanced "W", full force-feed lubricated
- 3 point suspension — interchangeable precision parts.

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- Massive main frame with recessed fuel tank, 30% to 50% larger air receivers, bigger tool boxes, lifetime clutches, sectional radiators and intercoolers, electric starter, grouped controls, Timken bearing wheels, "Auto-Steer" axle, etc. all standard.

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"FLEET-FOOT"  
Loaders



"SPEEDLINE"  
Concrete Mixers



"SURE PRIME"  
Contractor's Pumps

## Runabout Cranes Are Useful in Many Roles

Runabout cranes for use in storage yard, warehouse, and on-the-job construction duties are built by the Henry Lohse Co., Inc. The firm makes a number of sizes, all mounted on International industrial tractors.

The Lohse units have capacities up to 5 tons. They are supplied with pneumatic or solid-rubber tires, and one model has caster-type rear wheels which allow it to turn in less than its own length.

Bulletins describing these cranes,

Models 6R, 6RC, and F, are available. The Henry Lohse Co. will be glad to supply them to readers of CONTRACTORS AND ENGINEERS MONTHLY. Write the firm at 50 Roanoke Ave., Newark 5, N. J.

## New Tennessee Dealer

The Power Equipment Co. has been organized at Knoxville, Tenn., by R. S. "Tommy" Tucker. He was formerly Vice President in charge of sales for the Brooks Equipment & Mfg. Co., and was associated with Good Roads Machinery Corp. for some years previous. R. O. Wright, formerly with Sullivan

Machinery Co., is Vice President, and Morgan B. Ayres, Secretary-Treasurer.

A complete line of construction, industrial, and municipal equipment will be carried by the firm. It will serve the eastern Tennessee territory from both Knoxville and Chattanooga. Headquarters are at 1358 Island Home Ave., Knoxville.

## Join Asphalt Institute

Charles A. Mayer has joined the staff of The Asphalt Institute, New York City. He has been appointed Administrative Engineering Assistant to Ber-

nard E. Gray, General Manager and Chief Engineer. During the war Mr. Mayer was associated with the construction of Army air bases at foreign locations. Before that he was a partner in the firm of Dow & Smith, consultants in paving engineering.

Edward M. Howard, former Seabee Commander, has been named District Engineer for the New England region by The Asphalt Institute. His experience in highway and airport construction results from service in Connecticut and Illinois, with the Seabees, and as a contractor, superintendent and consulting engineer.

# BOSS of the BULLDOZERS



THERE'S a new champion among bulldozers. Designed, built and put through the stiffest of job-tests by Caterpillar Tractor Co., the new "Caterpillar" Bulldozer entered the earth-moving field a year ago. Its success has been immediate and unqualified. Old hands in the business who have used them all say without hesitation it's writing new history in fast, economical earthmoving.

Among the outstanding advantages of the "Caterpillar" Bulldozer are these:

1. The scientific curve of the blade rolls the earth ahead instead of shoving it—producing greater capacity and lower yardage costs.
2. With the famous "Caterpillar" Diesel Tractor, this 'dozer is a

matched, perfectly balanced work unit. Tractor and 'dozer are both built by the same experienced manufacturer—both sold and serviced by the same well-equipped dealer.

3. It can be mounted and demounted quickly, with none of the inconvenience of an overhead frame.
4. Extra-hard steel gives the blade edge long, durable life.
5. Cable controls are fast, sure-acting, easy to operate, and cables and sheaves are protected from dirt-clogging.

"Caterpillar" Bulldozers with straight or angling blade are available for the three larger sizes of "Caterpillar" Diesel Tractors and they'll make a lot of dirt fly in the great earthmoving days that are ahead.

CATERPILLAR TRACTOR CO., PEORIA, ILL.

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ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

—for lowest costs on earth

# Equipment Is Key To Road Maintenance

## Mechanical Repairs and Upkeep of Old Machines Is Now the Bugbear in State Highway Program

THE equipment situation is critical in the state of Washington. New machines and spare parts are scarcer than they were during the war. Fortunately the State Highway Shop at Olympia is in the spare-parts manufacturing business. It is turning out more parts than it ever has before, in an effort to prevent the state highway-maintenance schedule from bogging down.

District No. 3, with yards and shops located 3 miles south of the state capitol building, is typical of six construction-maintenance districts in the state. District 3 has 624 miles of primary roads and 366 miles of secondary highways to maintain in seven counties: Pierce, Grays Harbor, Mason, Kitsap, Jefferson, Thurston, and Clallam.

Maintenance equipment used all during the war has now become so worn that failures are customary rather than exceptional. Spare pinion teeth, bearings, and other intricate parts are being turned out in lathes or built up by welding. Cast-iron welding by pre-heating has been developed with the aid of movable preheating ovens. Now whole engine blocks which are cracked or damaged by connecting-rod failures are being repaired and put back in service. Recently a cracked head off the engine in a roller was welded, the valve seats were cut in, and the piece was put back on the road in less than a week.

L. P. O'Brien is the chief welder in the Olympia shop. He does all the tough or impossible welding jobs, and is as meticulous about cast iron as a Swedish cook about angel-food cake. O'Brien has set up two 5 x 10-foot pieces of heavy boiler plate as the base for his cast-iron ovens, and he adjusts loose firebrick to fit the shape of whatever piece is being repaired.

His technique in welding cast iron is to put most of the heat in the metal in these ovens, using charcoal briquettes for his fire, before he starts to weld. Once a temperature of about 600 degrees F is put slowly into the cast iron in an oven, it is much easier to run cast-iron or bronze brazing rod in at from 1,000 to 1,400 degrees. Then the cast iron will not build up stresses and break.

"Build up the temperature slowly and you control your weld," is O'Brien's motto. "When the weld starts controlling you, it's time to quit welding and try something else."

### Shop Assembly Line

A large part of District 3 rolling stock consists of trucks and automotive equipment. Most of the trucks are now so old and have seen so much service that they need some kind of repair every week they are on a job. When one of these trucks comes in for repairs, it passes through an assembly line which is indicative of the shop set-up.



Complete line of gasoline, pneumatic and electric driven concrete vibrators and grinders. Write for information and prices.

**ROETH VIBRATOR COMPANY**  
1737 Farragut Ave. Chicago, Ill.

It goes first to the wash rack. There it is washed and steam cleaned before it comes into the shop. Steam cleaning frequently exposes defects which might pass unnoticed if left covered with dirt.

In the shop is an equipment card with that truck's entire history from the time it was purchased. Each repair, each adjustment, each labor job expended on that truck is noted on the card. By studying this record, or comparable records kept on every other piece of equipment, the shop foreman can anticipate breakdowns of parts which have seen long service.

In the case of a simple repair, the truck is tied up only long enough to have that part replaced or adjusted, and the brakes and lights checked before it is again put on the road. In the case



C. & E. M. Photo  
A Department of Highways shovel, just overhauled in the Olympia shop, crawls onto an equipment trailer to be hauled out to a slide maintenance job.

of a major overhaul, the truck is torn down at the end of the shop nearest the blacksmith and welding departments. An overhead crane mounted on rails pulls engines and carries heavy parts to the department which will do the necessary repair work.

Thus it is not at all unusual to find a

truck in the major overhaul stages, with its valves and brake bands and pistons in the motor-repair department, its distributor and spark plugs in the electrical department, its battery being charged, its fender being welded by the welding department, and a new hitch

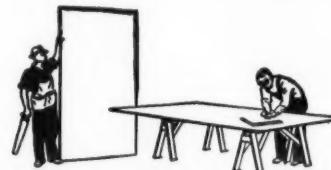
(Continued on next page)

## These Grade Trade-Marks on Douglas Fir Plywood mean

# Quality

## kept to Uniform Standards by Rigid Inspection!

THERE is a type and grade of Douglas fir plywood manufactured especially for every building need. Each must meet rigid standards of quality. Current production is constantly inspected . . . constantly tested in the Douglas Fir Plywood Association laboratory. Choose the type and grade for your particular job by these "grade trade-marks," which appear on every panel. Use it with complete confidence; its dependability is backed by an industry-wide quality standard.



## Substantial Production Now Allocated to Veterans' Housing

Because the needs of the Reconversion Housing program are so acute, Douglas fir plywood is today being allocated by the Civilian Production Administration. This means that a substantial proportion of the Douglas fir plywood industry's current production must go to housing contractors, stock cabinet manufacturers, prefabricators and distributors.

As a result, the supply situation for all other industrial and con-

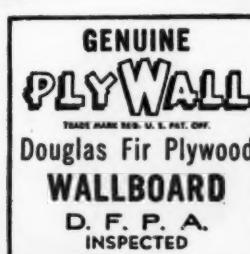
struction uses is temporarily a difficult one. It is a fact, however, that more plywood is being produced today than in pre-war years. Once the present overwhelming demand has been met, an increased amount will be available for all uses in construction and industry.

Anticipate YOUR needs as far in advance as possible — and discuss those requirements with your regular source of supply.

**Douglas Fir Plywood Association**  
Tacoma 2, Washington



PLYPANEL is the grade of interior-type plywood made especially for high quality interior work on walls, ceilings, for booth partitions, cabinet doors and similar uses.



PLYWALL is the grade of interior-type plywood made for use where only one side is exposed, as in wall paneling. It is suitable for most stained finishes, for painting or papering.

**EXT. - D.F.P.A.**

EXTERIOR-TYPE plywood is made with completely waterproof synthetic resin binder especially for permanent exposure to weather and water. It is widely used for building exteriors, for outdoor signs, for railroad car siding, and in all phases of marine construction.



PLYSCORD is an unsanded utility panel of unusual rigidity, made to withstand the rigorous service demanded of wall and roof sheathing and of sub-flooring.

**PLYPANEL D.F.P.A.**

## Equipment Is Key To Road Maintenance

(Continued from preceding page)

for auxiliary equipment being made by the blacksmith, all at the same time. Major repairs are speeded up except where spare parts are involved, and that situation is more critical now than it was during the war. Moreover, all purchases have to be made in the somewhat cumbersome fashion of calling for competitive bids through another department, as provided by law.

A final step is involved before a truck or automobile is allowed to go back to work after passing through this shop. Its lights are tested. Then its wheel camber and caster are checked by a Weaver automatic aligning machine, which tells the condition of wheels, on a dial, when the truck is driven over the platform.

The Olympia shop has been outfitted with the following equipment over a period of six years:

### Welding Department

- 1 General Electric arc welder
- 2 shop-made convertible preheating ovens
- 1 bench vise
- 1 Airco oxyacetylene welding outfit
- 1 shop-made suction fan
- 1 Sioux flexible grinder
- Miscellaneous small tools

### Blacksmith Department

- 1 drill press
- 1 Manning, Maxwell & Moore drill press
- 1 A-B power grinder
- 1 Little Giant 50-pound power hammer
- 1 anvil
- 1 shop-made forge with Champion blower
- 1 Hossfeld Universal bending machine
- 2 DeVilbiss air compressors, G-E motors

### Heavy-Equipment Repair Department

- 1 radial drill
- 1 Airco oxyacetylene welding outfit
- 1 Superior 3-ton hoist
- 1 stock-threading machine
- 1 Canedy-Otto drill press
- 1 Boys & Emmes 18-inch lathe
- 1 Logan Model 825 lathe, 6-inch
- 1 Gould & Eberhardt shaper
- 1 Milwaukee 3B milling machine
- 1 Buffalo drill press
- 1 Baldor grinder

### Automotive Motor Department

- 1 Sioux valve-face grinding machine
- 1 shop-made rod-aligning jig
- 4 shop-made motor stands
- 1 Van Norman Jumbo 888 boring bar, 6-inch
- 1 Van Norman 4-inch boring bar
- 1 connecting-rod boring machine
- 1 Manley hydraulic press
- 1 movable hoist, 1,000-pound capacity
- 1 Superior 1-ton motor hoist
- 1 drill grinder
- 1 Robertson power hack saw
- 1 Sunnen hone
- 1 Monmouth clutch rebuilders
- 1 jig for rear-end-system checking
- 4 Walker 7-ton hydraulic jacks
- 1 Shepard-Thomason brake-riveting machine
- 1 Champion spark-plug cleaner

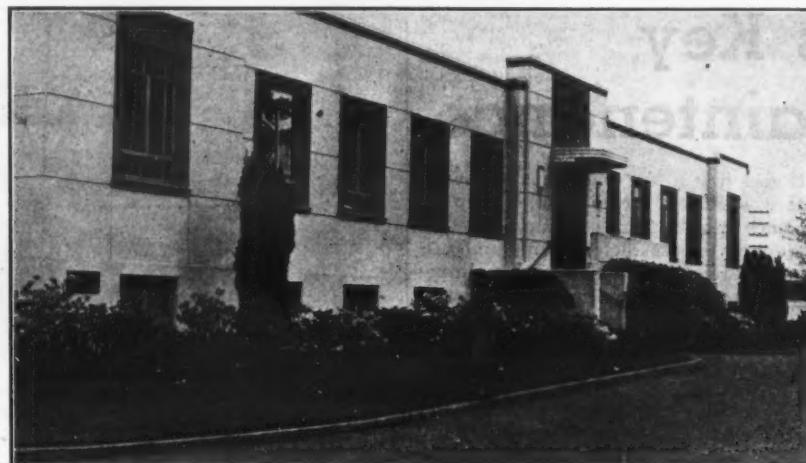
### Electrical Department

- 1 Allen generator and starter tester
- 1 Allen electric-motor test set
- 1 Allen battery charger
- 1 powered armature lathe
- 1 magnet charger
- 1 armature tester
- 1 fuel-pump checker
- 1 Electro Mixture Master

A Weaver brake-testing machine, a Weaver light-testing outfit, and the Weaver automatic wheel-alignment indicator complete the equipment picture in the main shop. Other buildings on the site include a paint, carpenter, and sign shop; wash rack; service station; parts shed; and the District 3 office building where headquarters offices are located.

### Maintenance Organization

J. H. Marshall, State Highway Maintenance Engineer, with headquarters in the Transportation Building of the



C. & E. M. Photo

Headquarters of the Washington Department of Highways in Olympia is an attractive building in elaborately landscaped grounds.

state-capital group, is in charge of all maintenance. The District Engineer of District 3, J. C. Claypool, is directly responsible for all maintenance work in

his district, having an assistant with the title of District Maintenance Engineer who is responsible to him for the performance of the work.

Under the District Maintenance Engineer work an assistant and a safety and traffic engineer. These two men help each other on traffic engineering, and the former supervises the work of a sign foreman.

Four division superintendents, working under the maintenance engineer, do what repair work is now done to state highways in this district. Under each of these division superintendents is a general foreman, a clerk, and an accountant. From seven to eight section men, a mechanic, and a helper also work under each division superintendent. The section men are in reality maintenance foremen. Each has from two to four helpers, and his work is more or less circumscribed as to type.

Veterans who worked for District 3 before their service in the armed forces are put on the payroll immediately after they apply for their old job.

### Maintenance Difficulties

District 3 is on the western slope of

(Continued on next page)

# Building a Highway.. Flight Strip.. Airport?



Get all the Hot Material You Need — Fast at Low Cost with a Cleaver-Brooks Portable Booster

THE big opportunity to show how Cleaver-Brooks Portable Boosters make quick work of auxiliary airports, emergency landing fields and strips came when they were put to use in meeting vitally important "RUSH" war assignments.

Hundreds of these boosters were on the job heating the oils and bituminous materials as needed. Construction crews were not delayed . . . flight strips and airfields grew seemingly over night.



Write On Your Business Letterhead . . . For the Bituminous mix Calculator — a ready reference slide rule showing weight of mix needed in lbs. and tons in relation to width and depth of area to be covered.

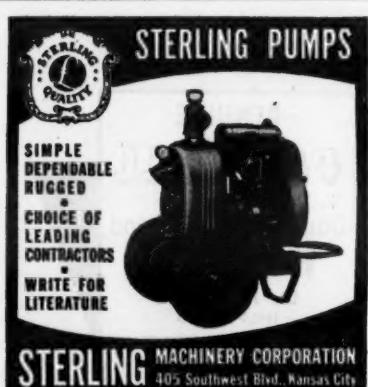
Cleaver-Brooks Boosters circulate and pump oils and bituminous materials while heating (approximately three times faster than is possible with steam) to a wide range of application temperatures as required on the job.

Bituminous boosters were pioneered by Cleaver-Brooks. They are in nation-wide use for airport and road construction and maintenance. They are without equal in speed and economy. Write for complete information.

CLEAVER-BROOKS COMPANY  
5110 North 33rd Street, Milwaukee 9, Wis.

# Cleaver-Brooks

TANK CAR HEATERS . . . BITUMINOUS BOOSTERS . . .  
AUTOMATIC STEAM-PLANTS



# Equipment Is Key To Road Maintenance

(Continued from preceding page)

the Cascade Mountain range. Rainfall is normally in excess of 44 inches, and in certain wet sections precipitation has been known to reach the unprecedented figure of 190 inches per year. The maintenance budget of \$439,118 for 624 miles of primary routes, and \$194,110 for 366 miles of secondary roads, includes the operating labor and expense of nine movable bridge spans, five of them on secondary roads.

Coupled with the supersaturated-clay ground conditions and this comparatively low budget, is a trend in heavy logging-truck traffic, new since V-J Day, which is playing havoc with bituminous roads. The demand for lumber in the past year has caused countless small operators, with only two or three trucks, to tackle the logging of previously unprofitable logs. Where heavy log loads have operated over state highways for as long as three months, it is possible in a great many places to find a pattern of holes along the side of the highway that is used when trucks are loaded. The side they use when they return to the woods empty will not have a single hole. There are variations on this, of course, but maintenance men in Washington have found instances of such havoc as clear-cut as the words in this paragraph.

Studies made on the behavior of bituminous failures over saturated subgrades point to a prevailing and progressive pattern. Normally a tiny dent appears in the pavement. It grows larger. By and by a chunk of black-top comes out. As heavy wheel loads hit this hole, more and more of the bituminous surface breaks off at the edges and whips out. One of these holes will soon wear out to the diameter of a washtub and the depth of a foot, and then it is a serious traffic menace to automobiles traveling 50 miles an hour.

These holes are patched by traveling crews. They broom the moisture out of the subgrade, paint the hole with MC-2 cut-back asphalt, and patch it with stockpiled patching. This patching material is mixed at a central plant, usually privately owned, using about 5 per cent by volume of MC-2 asphalt



C. & E. M. Photo

This close-up of the traffic-striping machine used by the Washington Department of Highways shows the arrangement of paint reservoir, air compressor, and spray guns.

and diesel fuel and 3/4-inch-maximum size rock.

The placing of road signs and the painting of guard rails is being limited to those places where such improvements are badly needed. Long reaches

of guard rail usually have about 50 feet painted on each end, until such time as the budget situation improves.

Incidentally, the Maintenance Department under J. H. Marshall at the state capital is inaugurating a new

policy on highway maintenance. Marshall contends that such items as traffic striping, lighting, guard-rail repair, mowing, shoulder landscaping, and the erection of signs, are not highway maintenance. Rather, he contends, these are service charges. Drainage and patching, however, are properly chargeable to maintenance. By breaking costs down along these lines during the past year, he hopes to arrive at a much more accurate picture of highway-maintenance costs. He also hopes to convince the State Legislature that when viewed in this light, the maintenance budget is small rather than large for that much road. Several of the legislators who admit they now see road maintenance in a new light seem favorably impressed by the idea.

Appropriations are made on a biennial basis. Much financing is done with "revolving" funds. For instance, large quantities of cold-mix material, asphalt, bolts, nuts, lumber (when they can get it!), and so on, are made or purchased

(Concluded on next page)



**"Gulf Quality Products and  
prompt delivery  
service"**

**help us get better all-round  
job efficiency"**

says Supt. John L. Dugan

\*Fred Berlanti and Son, Inc., of Harrison, New York, has just completed an important project on U. S. Route 22 near Phillipsburg, New Jersey. This \$700,000 job included approximately 100,000 cu. yds. of rock and earth excavation, 55,000 sq. yds. of 10" concrete pavement and 2 bridges.

**Shunk** *Snow Plow  
and Ice Removal  
BLADES*

Proved record  
of superior performance.  
Made of specially developed  
steel to withstand severe  
service conditions.

FOR ALL TYPES AND MODELS  
OF SNOW PLOWS  
Various widths, lengths, thicknesses—flat or curved—standard or special-punched ready  
to fit your machine.

SHUNK SAW-TOOTH  
ICE BLADE  
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

**Shunk**  
MANUFACTURING  
COMPANY  
ESTABLISHED 1854  
BUCKRUS, OHIO.

"PROPER lubrication with Gulf quality oils and greases helps keep all of our equipment in good condition—and Gulf's prompt delivery of lubricants and fuels helps us avoid delays," says Superintendent John L. Dugan of Fred Berlanti and Son, Inc.\* "We're satisfied that we get more work-hours from every unit of equipment and better all-round job efficiency by dealing with Gulf."

For some years now, there has been little allowance in most contracts for breakdowns and delays caused by mechanical troubles. That's why many leading contractors have formed the habit of using Gulf quality lubricants and fuels as basic profit insurance. They know that Gulf products help effectively to keep equipment on the job—and operating at top efficiency.

Write, wire, or phone your nearest Gulf office today and arrange to use Gulf higher quality lubricants and fuels on your next job. They are quickly available to you through 1200 warehouses in 30 states from Maine to New Mexico.

**Gulf Oil Corporation-Gulf Refining Company**

Division Sales Offices:

Boston • New York • Philadelphia • Pittsburgh • Atlanta  
New Orleans • Houston • Louisville • Toledo





C. &amp; E. M. Photo

A small maintenance force in Washington's District 3 places pre-mixed patching material on a state highway near Olympia.

## Equipment Is Key To Road Maintenance

(Continued from preceding page)

in advance of their need. These materials are stored or stockpiled, and a cost account set up. As the material is used, reports are sent in daily, and this fund is then built back up by charges against the job on which the materials were used.

The same sort of revolving fund is used for the purchase and replacement of equipment and machines. When a new piece of equipment is purchased out of that fund, a rental charge is set up. Each day that piece of equipment is used, the fund is reimbursed by its rental. Obviously it is to the best interests of the maintenance engineers to keep the machines at work as much as possible, so this fund can be replaced. The placement of equipment is controlled by the maintenance engineer to whom it is assigned, however.

Some of these charges are rather interesting. One of the most popular pieces of equipment, an Athey Force-Feed Loader, costs its user \$28 per day. This is due to the terrific demand for that piece of equipment in loading sod and debris in trucks when graders pull drainage ditches along the sides of highway shoulders. Other rental charges for some of the other district-controlled

machines are as follows:

Equipment	Daily Cost
6 White and Littleford asphalt heaters	\$3
2 Jaeger bituminous mixers	10
6 Littleford and shop-made oil distributors	10
5 Littleford, Galion, and Huber rollers	6 to 8
2 Ingersoll-Rand compressors	12
1 sack concrete mixer	6
1 shop-built traffic-line marker	24
1 Barber-Greene belt conveyor	15
2 draglines, Clyde and Novo hoists	10
1 Allis-Chalmers power unit	10
1 Symons vibrating screen	10
1 Rex 4-inch water pump	2
1 Mud-Jack	10
1 Buckeye spreader box	5
14 Austin and Galion pulled graders	3 to 5
2 Caterpillar No. 12 motor graders	15
1 Austin-Western; 2 Allis-Chalmers patrols	15
1 Warco, 11 Galion, and 5 Rome patrols	10
13 Toro, John Deere, and Fordson mowers	8 to 8.50
3 power brooms	8
1 Universal, 1 Bay City, and 1 P&H shovel	20
4 flat-bed low trailers	10
1 GMC 1,300-gallon oil transport	2

With auditing, construction, and engineering headquarters also located in the main office building, it is easy for the District Maintenance Engineer to get those services when needed by his maintenance forces.

Once each month a safety conference is held with the safety engineer presiding. All key maintenance and construction personnel attend. The result of

investigations of accidents is given by the safety engineer, and a round-table discussion held of accident prevention. As a result of this constant interest in that phase of maintenance, the frequency and severity rate of accidents has dropped during the past two years.

With Washington highways now getting the most energetic working over from traffic which they have had in a decade, maintenance problems are mounting. So far, using the repair shop to its utmost, the tide has been stemmed. This year all of District 3, its men and equipment, will be called upon to do the biggest maintenance job in years. How the challenge is met may well be the basis for some future article.

### Welding-Cable Parts

Cable connections for use in electric welding are shown in a 12-page catalog published by the Tweeco Products Co., English at Ida, Wichita 1, Kans. The firm's line includes tools and fittings that are required on a cable, both elec-

trode and ground, mechanically to hold and electrically transmit welding energy from the welding machine to the point of deposit.

Products shown in the catalog include electrode holders of various types, ground clamps, cable connectors, machine terminals, cable lugs, cable splicers, jig and fixture clamps, and others. A complete price list of Tweeco units and parts is given.

Copies of the catalog, Form 1946-T, can be obtained from the above address on mention of CONTRACTORS AND ENGINEERS MONTHLY.

### Data on Snow-Plow Blades

Snow-plow blades made of a controlled-analysis steel are described by The Shunk Mfg. Co. in a bulletin available on request. The firm can furnish blades for all types of snow plows, the bulletin says, and in any sizes. You can secure Bulletin SP-44 by dropping a card to Shunk at Bucyrus, Ohio, and mentioning this notice.



Permanent  
**BRIGHT SIGNS**  
for DETOUR SIGNS  
and BARRICADES

• Detour Signs easily made with Cataphote Chain Reflectors can be used over and over again. No loss of reflection. Also wood mounted buttons for wooden temporary signs. Low cost. Send 25c for samples. Cataphote Corp., Toledo, Ohio.

**CATAPHOTE**  
REFLECTOR CHAINS



**KOTAL COMPANY**  
360-68 Springfield Ave. ★ Summit, N. J.

**KOTAL Master Mixes**  
The Advanced All-Weather Aid in Building Better Roads

less of season or weather. That's a great convenience and a saving for plant, contractor and customer. Only the KOTAL Process makes this possible.

Let us tell you more about this important scientific development in the art of road building and maintenance. We'll gladly send free booklet to you—also the name of your nearest supplier.



# PREFERRED! for the way they SERVE ... and the way they're SERVICED!

The more a man has to depend on any engine-driven industrial unit on the job, the bigger the advantages a Ford-built engine will give him.

Ford engine reliability, efficiency and economy are time-proved *facts*, known and accepted the world over. And when you back up these facts with famous, universal Ford Dealer Service, you have an unbeatable combination.

Thus, Ford-powered equipment is easier to sell. And the use of a Ford engine eliminates any need for the equipment manufacturer or distributor maintaining extensive engine service parts stocks. Ford Dealers and Parts Distributors gladly shoulder that responsibility.

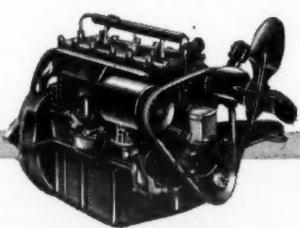
You'll see more and more fine and popular equip-

ment powered with these great engines, now that they're available once more. Light plants, pumps, compressor units, portable power units, saw rigs, mills, blowers and many other pieces of equipment have been developed with Ford engines to furnish the sure-fire power.

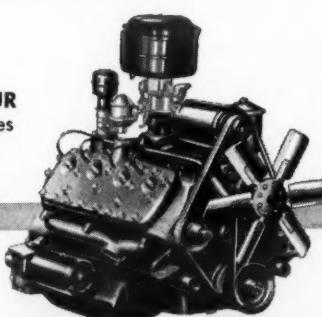
The three popular Ford-built engines, shown below, are now available to manufacturers and individual purchasers. Each offers reliable, enduring power applicable to a wide range of uses. For detailed specifications and dimensional data, write—

**FORD MOTOR COMPANY**  
*Industrial and Marine Division, Dept. 70*  
DEARBORN, MICHIGAN

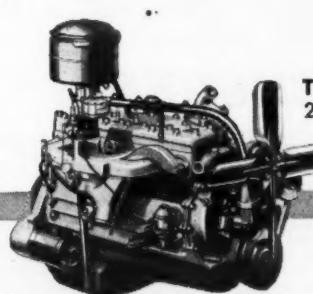
*Specifications and designs subject to change without notice.*



THE 40-HP FOUR  
119.5 cubic inches  
displacement.



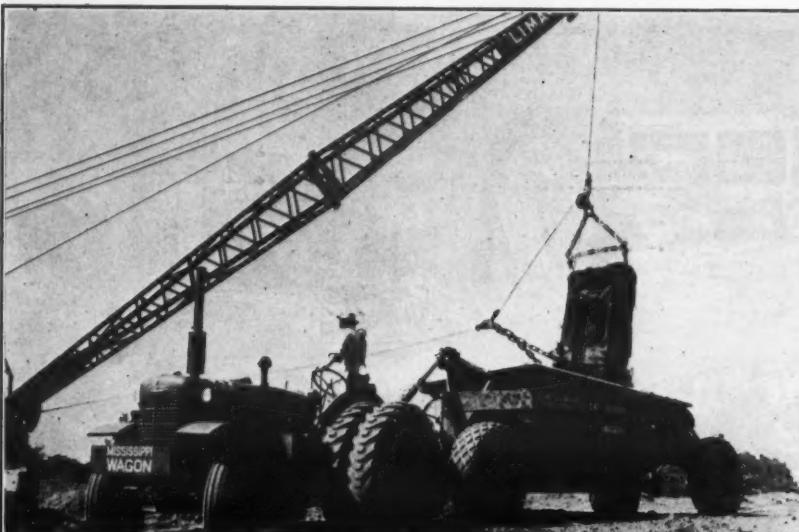
THE 100-HP V-8  
239 cubic inches  
displacement.



THE 90-HP SIX  
226 cubic inches  
displacement.

## FORD-BUILT ENGINES

NOW AVAILABLE FOR INDUSTRIAL AND MARINE POWER



One of the H. E. Williams Co.'s Mississippi Wagons receives a load from a Lima 3/4-yard dragline, at a gravel pit 5 miles off the highway.

## Fast Hauls Expedite Road Repaving Job

Expected to be ready for traffic this month, the final link of 24-foot concrete pavement on Texas State Highway 6 is now nearing completion. One of the state's first large post-war projects, the work entails reconstruction, widening, and paving a 6-mile stretch between Waco and Marlin in Falls County.

The H. E. Williams Co. of Waco holds the contract for the job, valued at \$340,000. It covered the construction of a 6-mile gravelled detour in addition to the highway work. Grading and placing of gravel topping on this temporary route was completed in July, and demolition of the old asphalt pavement on Route 6 was begun.

Ten Mississippi Wagons were used to haul the 78,000 yards of clay-gravel needed for topping the detour road and laying the new roadbed. The material was moved from a pit 5 miles off the highway, over a haul route averaging 8 1/2 miles one way. Carrying loads of 10 yards or better, the Wagons averaged over 20 mph on each round trip.

Other equipment on the project includes an Allis-Chalmers Model A-D motor grader as well as an A-C crawler tractor and grader, a 3/4-yard Lima dragline for loading the Wagons, 4 LeTourneau scrapers, 2 pneumatic-tire rollers, 2 sheepfoot rollers, a 34-E

Koehring concrete paver, subgraders,

finishing machines, a mechanical spreader, a longitudinal float, water trucks, and a crane and clamshell.

## Self-Powered Heater Gives Winter Warmth

To help contractors avoid cold-weather delays, the Herman Nelson Corp. offers a self-powered heater. The unit is portable and self-contained. It is said to produce from 190,000 to 250,000 Btu's of heat hourly, about three times the amount needed to heat a five-room house, and can be used for preheating engines and other equipment, temporary heating of structures, thawing, spot heating for workers or materials, and for winter concreting.

The heater consists of an enclosed, gravity-fed combustion chamber and finned stainless-steel heat exchanger, within which the fuel is burned and the heat generated. An axial fan forces ventilating air across the outside of the heat exchanger. The heated air is discharged

through collapsible ducts to the areas to be heated.

Weighing 312 pounds, the heater is 41 inches high, 55 long, and 32 wide. It is driven by a 1 1/2-hp engine on about 3 gallons of gasoline per hour. A 1-hp electric motor is optional. Ducts are 12 inches in diameter and 24 feet long. Semi-pneumatic wheels, a skid base, or an overland trailer can be supplied for the base.

A full description of this Herman Nelson heater can be obtained from the manufacturer. Just write the firm at Moline, Ill., mentioning this news notice.

## Bans Right-of-Way Evils

Legal action will be taken by the Kentucky Department of Highways against persons who erect buildings or signs, or dump trash on state highway right-of-ways. Such encroachments obstruct many scenic views and offset tourist-promotion efforts. Above all, they present a dangerous traffic hazard, Commissioner J. Stephen Watkins says.

## Digs 600 Holes a Day

For Foundation Footings . . . Highway and Industrial Fencing . . . Rural Telephone and Light Poles . . . Airports . . . Cemeteries . . . Holes for Dynamiting, etc.



## SPEEDIGGER<sup>TM</sup>

Quickly mounts on all row crop tractors; also available for all crawler-type tractors. Drills at any angle, up to 54" deep. Standard auger sizes from 4" to 12".

Operator stands on platform, behind protective handrail . . . out of dirt . . . away from moving parts. Built extra strong for toughest digging operations. Drills through hard dirt, frosty ground, roots and gravelly soils. Thousands in use by state highway departments, utility companies, U.S. Gov't. engineers, etc. Thoroughly proved. Guaranteed.

WRITE for details and prices . . . available now . . .

R. J. PIPER MANUFACTURING CO.  
Princeton, Illinois  
New York Office: 100 E. 42nd St.

FISHERMEN make their money by getting back fast with the most fish and at the least cost. There's no profit in hauling around big, heavy engines that take up a lot of room.

So every day sees more and more General Motors Diesels going into fishing boats. And for good sound reasons.

These Diesels pack more power in less space—weigh less than older types. So GM-powered boats carry more fish.

GM Diesels get efficient combustion from low-cost fuel—keep going day after day with the least maintenance.

Add these features to the re-

duced fire hazard, easy starting, quick availability of parts and service, and you see that GM Diesels have features that are valuable everywhere power is needed. That is why they're taking over so many jobs that Diesels never handled before.

Whatever needs for power you may have in road-making machinery, cranes, shovels or any other construction equipment—look to GM Diesels.

## Features of GM Diesels Important to Every User of Power

QUICK TO START on their own fuel

LOW COST—run on common fuel oil

EASY TO MAINTAIN—clean design plus accessibility

LESS FIRE HAZARD—no volatile explosive fuel

COMPACT—readily adaptable to any installation

SMOOTH OPERATION—rotating and reciprocating forces completely balanced

QUICK ACCELERATION—2-cycle principle produces power with every downward piston stroke



DETROIT DIESEL ENGINE DIVISION

DETROIT 23, MICH. • SINGLE ENGINES . . . Up to 200 H.P.

MULTIPLE UNITS . . . Up to 800 H.P.

GENERAL MOTORS

# The Future Pattern For Our Highways

Planning Surveys Showed Needs and Weaknesses of Present Systems; Are Guide To Future, MacDonald Says

THE pattern of our present highway program was set by the Federal-Aid Highway Act of 1944. This authorized a Federal appropriation of \$500,000,000 in each of the three fiscal years following the end of the war, to assist the states in constructing highways designed to meet modern traffic requirements. The pattern is one that recognizes the essential functions of the principal classes of our highways and streets, and provides in reasonable proportion for the improvement of each class. It is a road-building program, not an unemployment program. The purpose of the legislation is to aid in the development of our highways in a manner commensurate with modern traffic requirements. It cannot be deferred until there is a need to offer relief employment in the way of public works. The need exists today, and only the lack of labor and materials, together with other exigencies, offers any reason for delaying the program.

For primary highways included in the 232,000-mile Federal-Aid system, the Act authorizes annual appropriations of \$225,000,000; for the improvement of Federal-Aid routes in urban areas it earmarks \$125,000,000 annually; and for the development of a Federal-Aid system of secondary roads in each state, it authorizes appropriations of \$150,000,000 to be made for each of the three years.

The states generally match the Federal funds in equal amount. So the legislation made it possible for them to undertake a \$3,000,000,000 highway program, with Federal assistance, in addition to work that will be financed entirely by state and local funds.

Thus, there is a well defined program for highway improvement to be effected where improvement is most needed. There is also a definite promise of liberal financial support for carrying out the program. But, at the moment, the highway-building industry finds itself in much the same position as the motor-vehicle industry as to prospects of early substantial production. It is not dollars or demand for its product that are lacking, but materials, labor, and equipment.

## Present Status of Program

Progress of the highway program depends upon industrial production and conditions in the labor market. And right now, uncertainty prevails among highway officials and road contractors about the quantity of materials and labor that may be available in the months ahead. Their uncertainty has delayed the start of construction on many large projects which require scarce materials, such as steel, structural concrete, and lumber for concrete forms.

As of May 11, plans were ready for contracts involving work estimated to cost \$864,000,000. Plans are rapidly maturing for projects estimated to cost \$2,600,000,000. But the immediate approach to the letting of contracts invariably is conservative.

The mileage of projects approved for immediate contract offerings, plus the mileage advertised for lettings, plus the mileage of contracts awarded last May, totaled 9,400 miles of road work. It will be completed at a cost of approximately \$500,000,000. This approaches the average pre-war annual Federal-Aid program measured by mileage. But it is

highly doubtful if more than 50 per cent of this total will be placed under contract in the next six months, because of the limitations mentioned.

## Basis for Highway Planning

The pattern of our present highway program has also been affected by state highway-planning surveys. By making these, officials have learned some principles of traffic behavior. By applying them, they hope to tailor future roads to traffic needs, and not traffic to road needs.

One of the facts learned from the surveys is that traffic converges on principal routes. Thus, the proposed interstate system of highways, made up of our principal traffic arteries, will comprise only about one per cent of the total rural road mileage. But it will serve about 20 per cent of the rural vehicle mileage. All arterial routes in rural areas, including Federal-Aid highways and primary state systems, comprise only about 12 per cent of the

(Continued on next page)

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# Future Highways

(Continued from preceding page)

rural mileage. But they serve about 72 per cent of the rural vehicle mileage. Other roads which feed these arterials have 88 per cent of the rural mileage, but they have only 28 per cent of the vehicle mileage.

In cities, also, traffic tends to converge on arterial streets. But since the existing streets generally are inadequate to carry the accumulated movement, some traffic dispersion results. Because of this inadequacy, the ordinary city arterial street seldom carries more than 25,000 vehicles per day. Where expressways of ample design are provided, however, traffic concentrates on them and volumes sometimes exceed 75,000 vehicles per day.

Another significant fact revealed by the traffic surveys is that the drivers of most vehicles approaching a city want to go into, and not around, the city. Of traffic approaching cities of over 500,000 population, only about 6 per cent is destined to points beyond the city; 94 per cent is headed for the city. A relatively high percentage of traffic converging on small cities also has the city as its destination. The surveys have shown that only 41 per cent of the drivers approaching small cities want to go around. So, it is quite clear that congestion on city streets cannot be eliminated by building by-passes; traffic has to be carried into the cities.

In cities, the surveys have shown, there is inevitable conflict between the needs of local and through traffic which makes it impossible to serve well both classes of traffic with the same facilities. This fact is the basis for the fast-multiplying plans for express highways. It is basic also to proper solutions of the parking problems. It explains particularly the need for belt lines around the business sections of cities to attract and remove from the congested business streets a large volume of through traffic which has no destination in the central area.

#### Rise in Traffic Volume

Traffic volume, as it has been surveyed, has trended constantly upwards. During the 20-year period from 1921 to 1941 the number of vehicles registered in the United States increased more than threefold—from 10,500,000 in 1921 to nearly 35,000,000 in 1941. During the same period the total annual mileage of travel by motor vehicles increased slightly more than sixfold—from 55,000,000,000 vehicle-miles in 1921 to 334,000,000,000 in 1941.

This remarkable increase was brought about by a steady rise in the average annual volume of travel per motor vehicle. The average annual mileage of motor vehicles in 1921 is estimated at 5,230 miles. By 1931 this average had risen to 8,330 miles, and in 1941 it was approximately 9,570 miles per year. In 1943, when gasoline rationing and other wartime travel restrictions were in effect, traffic volumes were 42 per cent below the 1941 level. But by January, 1946, the volumes had again increased to a point slightly above the 1941 level.

The use of highways is preponderantly for short trips. This was demonstrated by an analysis made in 1939 of the travel characteristics of passenger cars and trucks in eleven states. The analysis paid particular attention to the length of trips that extended beyond city limits or were entirely rural in character.

In terms of miles traveled, rather than number of trips, 41 per cent of the mileage of passenger cars was accounted for by trips of less than 20 miles; 59 per cent by trips of less than 40 miles; and 77 per cent by trips of less than 100 miles.

The range of truck travel is somewhat greater than that of passenger cars. In the 1939 survey it was found that 34 per cent of the trips made by trucks were less than 5 miles in length; 80 per cent were less than 20 miles; and 98 per cent were less than 100 miles.

These figures may be changed somewhat in the future, but actually the motor vehicle is a short-haul vehicle, and the area of conflict with other forms of transportation is very small.

#### Traffic Speed

Now, as to speed. The average speed of motor travel shows an upward trend. Speeds on rural highways immediately prior to the war averaged 47.1 miles per hour. During the war period when the 35-mile speed limit was in effect, the average speed on rural highways dropped to 36.4 miles per hour. But in recent months it has returned to an average of 45.5 miles per hour, which is only slightly lower than the pre-war average. Top speeds of 70 and 80 miles per hour, however, have not shown any

tendency to increase since 1934.

The development of urban expressways and controlled-access highways will eliminate delays now caused by traffic signals at frequent intersections. It is believed that drivers will then be content to maintain a reasonable average speed in reaching their destinations, whether they are going from the suburbs into the city, or from city to city. When it is possible for them to enjoy the free use of main highways, without having to stop for cross-traffic, road builders and officials will have provided a safer utility. They will have encouraged a normal driving speed that is within the capacity of the average individual.

#### Improved Design

Safer highways demand improved design standards. In the early stages of highway design, a 500-foot sight distance was considered adequate to meet the demands of the low-speed low-volume traffic that utilized the highways at that time. Design criteria to-

#### PAPA NEEDS NEW SHOES



day require continuous unobstructed vision for 600 feet for safe stopping at speeds of 70 miles an hour. In addition, sight distances up to 2,600 feet are required at frequent intervals for safe passing on high-speed highways. These standards are essential to improve the

(Concluded on next page)

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# TEXACO

## Future Highways

(Continued from preceding page)  
efficiency and reduce the hazards of traffic flow.

The bulk of our highway system is composed of two-lane two-way traffic. If fast-moving traffic cannot overtake and pass slow-moving vehicles safely because of insufficient sight distance, the road becomes inefficient. If passing is accomplished where sight distance is restricted, hazards are introduced. The provision of adequate sight distance for high-speed traffic requires limitations in gradient and curvature.

Rural highways with hourly traffic volumes exceeding 800 vehicles require two traffic lanes for each direction of travel. It is essential to provide a sufficient number of lanes for the estimated traffic demand on high-volume facilities. Design standards must contribute materially to the efficiency of motor-vehicle operation, and only by providing sufficient sight distance and traffic lanes can hazards be reduced and efficiency increased.

### Conclusion

These findings, obtained through long years of research, are indicative of the background of established fact that is now determining what our future program should be.

From an address by Thomas H. MacDonald, Commissioner, Public Roads Administration, before the Economic Club of Detroit.

### Heads Four Cement Firms

Smith W. Storey of Chicago, President of Consolidated Cement Corp., has succeeded the late John L. Senior as President of Florida Portland Cement Co., Signal Mountain Cement Co., and Trinity Portland Cement Co. Mr. Storey has been Executive Vice President of these firms, and is a Director of the Portland Cement Association.

Howard Miller, Secretary-Treasurer of Consolidated, has been named Vice President and Treasurer of the other three companies.

## Steel's Wide-Range Use In Road Work Is Shown

Steel products for highway use are featured by the Bethlehem Steel Co. in a 28-page catalog available on request. Under such headings as right-of-way, highway bridges, bridge foundations, paving, and guards and posts, the catalog lists many steel items.

Wire rope, drill steels, corrugated roofing and siding for sheds, galvanized culvert sheets, pipe, nails, timber-bridge hardware, structural steel, concrete-reinforcing bars and trusses, Battledock floors, cables, piling, road joints, center strips, guard rails, rail and fence posts, post drivers, and other Bethlehem products are listed and described.

Highway engineers and contractors should find this booklet of interest as it shows the wide use to which steel is put in modern highway construction. Write the Bethlehem Steel Co., Bethlehem, Pa., for Catalog 191, "Steel for Highways", and mention this notice.

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## Rustproof Compound



The new Oliver Imp hydraulic bulldozer for small tractors is entirely front-mounted, leaving the rear of the tractor free for installing other units.

### Hydraulic Bulldozer Fits Small Tractors

All the engineering features of large bulldozers are incorporated into its new small hydraulic dozer, announces the Oliver Corp. Known as the Imp, the new unit is entirely front-mounted.

When combined with the Cletrac HG-42, a small crawler tractor, the Imp is especially applicable to small jobs, Oliver says. Simply installed, the new dozer has a reversible cutting edge, rigid moldboard and push arms, and is so constructed that the underframe mounting allows for a minimum width of cut, the manufacturer says. A single lever controls lifting, lowering, floating, and hold positions hydraulically, while all thrusts are transmitted to the drawbar connections.

Write the Industrial Division of the Oliver Corp., 19300 Euclid Ave., Cleveland 17, Ohio, for more complete details and specifications on the Imp, and mention this news report.

### Diesel Electric Plants

Diesel-powered electric plants in five models are featured by the Witte Engine Works in a new circular. These Witte Dielectrics are rated from 2.5 kw to 8 kw or 3 to 10 kva respectively. The two largest models, 6 kw-7.5 kva and 8 kw-10kva, are now equipped with the constant voltage generator recently announced. This generator eliminates voltage drop when sudden loads are placed on the line and automatically compensates for any sudden changes in load. The circular, Form 55, and information on the new generator will be sent on request. Write the Witte Engine Works, 1600 Oakland, Kansas City 3, Mo.

### Rotary Wing Plow Slopes Snow Banks

Since winter's snowstorms are not far away, it is none too soon for America's highway engineers and airport managers to prepare to meet winter problems. Among the available equipment is the Roto Wing rotary plow. Used on any make of four-wheel-drive truck of 6 tons or larger, the plow is designed as a versatile snow fighter operating at high speeds.

The Roto Wing is attached on the truck, back of the V-plow. As the truck moves forward, the snow travels up the wing's moldboard to a rotary blade. This blade takes the snow, accelerates its speed, and casts it as far as 150 feet into the fields. The snow is discharged through an arc of 360 degrees, and does not windrow along the side of the road or runway. Nor does it blow up in front of the cab to affect the operator's vision.

Attached to the side of the truck at the front, the Roto Wing is set at a 45-degree angle to the line of travel. It can be operated at road level, or set at any desired height or tilt through hydraulic controls. This allows it to crop the roadside drift without creating vertical snow banks. The rotary blade, set into the moldboard, gets its power from an auxiliary engine mounted on the truck.

The Roto Wing is especially applicable to reduction of snow banking along shoulders, and to elimination of windrows along airport runways, it is reported. Preventing banking reduces maintenance difficulties as the winter continues. The speed at which the unit works, 15 to 25 mph. is another feature.

At the present time, delivery on Roto Wings is running from 30 to 60 days after receipt of order. A folder of photographs showing the Roto Wing in action is available from the manufacturer, together with a more detailed description of its operating principles. The folder can be secured on mention of this news report. Write the Roto Wing Co., Shakopee, Minn.

### Rubber-Base Paint

All types of outdoor painting, whether on concrete, wood, or metal, can be done with Paratex, a product of the Truscon Laboratories. Paratex is a rubber-resin formulation which is said to be unaffected by the alkali content of concrete, and to be resistant to chemicals,

acids, salts, and other disintegrating forces.

Readers of CONTRACTORS AND ENGINEERS MONTHLY can obtain full details on Paratex by dropping a post card to the Truscon Laboratories, Caniff & Grand Trunk RR, Detroit 12, Mich. Mention having read this notice.

### Dealer Resumes Service

C. B. Skinner, dealer in construction and industrial equipment in New Orleans, La., before the war, has returned from duty with the Army, and has re-established his business at 816 Howard Ave.

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Bastic-type signs are used to mark the Blue Star Memorial Drive in New Jersey. Flowering dogwood is being planted along this Drive as a tribute to New Jersey members of the armed forces in World War II.

## Dogwood Planted Along Roadsides

### Blue Star Drive Planned As Memorial for Service People; Slopes Flattened Or Stabilized With Trees

LIVING tribute to service men and women of New Jersey advanced further this spring when over 6,000 flowering-dogwood trees were planted along U. S. 22, important east-west cross-state highway. Two sections of this artery, known as the Blue Star Drive, have been selected as a permanent memorial. But eventually, as many dogwoods will line the four-lane highway as there were men and women from New Jersey in the armed forces during World War II.

Most of the planting has been done on a 5½-mile stretch between North Plainfield, Somerset County, and Mountainside, Union County. At this location, U. S. 22, or State Route 29, is somewhat west of the commercialized and industrialized east side of the state. So the natural beauty of the countryside is being enhanced by roadside planting. The project is sponsored by the Garden Club of New Jersey, which has collected the funds to purchase the trees. The work of selecting, planting, and maintaining them is being carried on by the New Jersey State Highway Department. The Department has also flattened many backslopes along the road. Where lack of the necessary space interfered, the Department has stabilized the slopes by planting young trees to check erosion and slides.

#### Blue Star Memorial Drive

The start or northeast end of the Blue Star Drive in Mountainside is at the Locust Grove Union Chapel. There a roadside sign has been erected to signify its dedication. Completed in 1932, the route has dual concrete roadways, each 20 feet wide, with 10-foot shoulders on the outside that have a slope of ¼ inch to the foot. A system of catch basins along the ditch line provides adequate drainage. The dual roads are separated by a planted area that varies in width according to the right-of-way available. However, the average right-of-way width is only 100 feet. This means that the roadside strip beyond the shoulder on each side is only about 10 feet wide. So in order to have adequate space for planting, the State sought permission from owners of abutting property to put dogwoods on their land. For the most part cooperation was excellent, since the property was improved at no cost and with no strings attached to the benefit.

Although written agreements were negotiated between the State and the property owner, no easements were

granted to the State. But neither could the owner claim any loss or damage to his property because of the planting. Some property owners granted the State unlimited distance for the improvement, but the usual strip was between 25 and 50 feet. Before any planting was done on this strip it was first cleared of debris or rubbish. If it happened to be woodland, the existing growth was thinned selectively. Desirable native growth, such as high-bush huckleberry, spice bush, red maple, oak, and birch, was retained and room left for the addition of informal groupings of dogwoods.

Where space permitted, many of the original 1½ to 1 backslopes were flattened to 4 to 1 by dozing with a Caterpillar R4 tractor equipped with a 6-foot blade. This unit also either dozed or pulled out old tree stumps on the slopes. When the operations were such that a large quantity of earth was removed from the slopes by dozing, a Bay City ¾-yard shovel was moved in to load the excavated material into three 1½-



C. & E. M. Photo

Robert S. Green, Supervising Landscape Engineer for New Jersey, points out how the larger dogwood trees were balled and burlapped for transfer from the nursery to the roadside.

ton trucks. These hauled it away for waste on the fills or low places along the road. Altogether six trucks were used either in grading or in hauling the trees from the nurseries to the road.

#### Flowering Dogwood

Although the floral emblem of New Jersey is the violet, the Cornus florida or white flowering dogwood was chosen to be featured on the Blue Star Drive because it is the state's most beautiful native tree. Its large white blossoms in the spring, and its foliage and clustered red berries in the autumn, give it two full seasons of spectacular display. In addition to the dogwood, and acting as a background for it, other trees such as native scarlet and red oak, white pine, and hemlock were also planted, along with flowering native shrubbery.

The project really started in the autumn of 1944 when about 2,000 dogwoods were planted along this road. Those trees, as well as the ones planted this year, were purchased with funds raised by the Garden Club of New Jersey from donations by corporations, organizations, clubs, and public-spirited individuals. All future trees will be purchased in the same way. A 5-foot nursery-grown tree can be planted on

(Continued on next page)

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ENGINE—Industrial Type Gasoline, approximately 30 h.p. S.A.E. Rating, with starter, generator, and battery. UNIT—mounted on steel-I-beam skids (Easily attached to or removed from truck or other conveyance). DRIVE—MECHANICAL—four forward speeds and one reverse. FEED—HYDRAULIC. LIFT—HYDRAULIC. LEVELING—HYDRAULIC. HOLE SIZE—Up to and including 24 inches. (Larger diameter on special order.) DEPTH OF HOLE—8 to 9 feet with standard machine (greater depth on special order). WEIGHT—Approximately 3900 pounds. WIDTH—4 feet, 3 inches; LENGTH—10 feet.

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C. & E. M. Photo  
Landscape workers prepare the holes for oaks to serve as background for the dogwood trees already transplanted to the roadside of the Blue Star Drive in New Jersey.

## Dogwood Planted

(Continued from preceding page)

Blue Star Drive for approximately \$1. A donation which does not specify the exact number of trees is used to plant an area with trees and shrubs of varying size to fit a landscape design. As this four-lane highway is one of the great traffic arteries between New Jersey and other states, it is estimated that 29,000 cars will pass the memorial daily.

Because of the purpose for which the trees are being used, the nurseries have cooperated with the Garden Club to provide the trees as economically as possible. Most of them are grown at a nursery, where the Garden Club purchases them in the ground. They are dug by the Highway Department and transplanted along the roadside or in the median strip.

### Planting

The planting this spring was done in about 40 working days in the fairly short season between March 25 and May 15. The latter part of this period coincided with dogwood-blossom time which lasts two or three weeks between the middle of April and the middle of May. A force averaging 50 laborers and 6 foremen from the landscape crew was assigned to the work. Altogether the State has about 135 landscape laborers from the nine districts, but only three districts were represented on this project.

At the nursery the trees were dug from large blocks, and those of larger size, 7 to 10 feet high, were balled and burlapped (B&B), while the smaller ones were classified as bare-root stock. After being hauled to the site, the B&B's were unloaded and stood in groups until they were planted. The bare-root stock could not be left in this fashion, however, if the holes had not been dug to receive them. On the way to the job they were covered with burlap so the roots would not dry out, and if they were not used immediately they were placed in a heeling area near-by.

This heeling area contained a V-shaped trench, 1½ to 2 feet wide and 1½ feet deep, in which the bare roots were placed as the trees were stretched out on the ground lengthwise of the trench. The roots were then covered with dirt, and these small 2 to 5-foot trees could be left safely in this area for a week or two before planting.

The planting was well organized. Wooden stakes were set out on a varied spacing of 8 to 10-foot centers each way to mark the location of the trees. Holes were dug by hand with spades or shovels. The dogwoods required a hole 1½ feet in depth and 2 feet in diameter; the larger trees of the various other types serving as a background were set in holes averaging 2 feet in depth and 3½ feet in diameter. Some of the pines and hemlocks thus planted were up to

12 feet high. The topsoil from each hole was set to one side and later mixed with well rotted cow manure. Then it was placed in the bottom of the pit which had been grubbed as deeply as possible. The amount of manure required varied from 5 pounds for a shrub to 10 pounds for a large tree, and care was taken that no manure came in contact with the roots themselves. The trees were planted at practically the same depth at which they stood before transplanting.

After being cut free, the burlap from the balled trees was usually left in the bottom of the pit. During the backfilling the earth was firmly packed to prevent the formation of air pockets. At ground level a 2-inch-deep shallow saucer-like basin, as large in diameter as the tree pit, was left around the tree. This area was then filled with a peat-moss mulch from 1½ to 2 inches in depth. The mulch, manure, and any additional topsoil required were provided by the Garden Club. The manure was procured from neighboring farms.

Trees over 2 inches in diameter were

supported by three guys made from No. 12-gage galvanized-iron wire equipped with 4-inch-long turnbuckles. Wooden

2 x 4's of white cedar, fir, or white pine, sharpened at one end and 24 inches (Concluded on next page)

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## RODGERS SHOP PRESSES



### SPECIFICATIONS

100 TON SHOP PRESS			
Model No. 108A	Bolster Opening		
Specifications	Standard	18"	24"
Overall Height—6½" Ram Travel.....	85½"	85½"	85½"
Overall Height—13" Ram Travel.....	94½"	94½"	94½"
Floor Space — Base.....	44" x 63½"	44" x 63½"	44" x 63½"
Hoist Extends Beyond Base.....	9"	9"	9"
Pump Handle Extends Beyond Base.....	13"	4½"	7½"
Width Between Side Members.....	45"	45"	45"
Depth Between Side Members.....	8½"	14"	20"
Depth Between Bolsters (Work Table).....	12½"	18"	24"
Maximum Daylight.....	35"	35½"	35½"
Minimum Daylight.....	7"	7½"	7½"

150 TON SHOP PRESS			
Model No. 109A	Bolster Opening		
Specifications	Standard	18"	24"
Overall Height—7½" Ram Travel.....	89"	89"	89"
Overall Height—14" Ram Travel.....	97½"	97½"	97½"
Floor Space — Base.....	44" x 70½"	44" x 70½"	44" x 70½"
Hoist Extends Beyond Base.....	9"	9"	9"
Pump Handle Extends Beyond Base.....	13"	4½"	7½"
Width Between Side Members.....	48"	48"	48"
Depth Between Side Members.....	8½"	14"	20"
Depth Between Bolsters (Work Table).....	12½"	18"	24"
Maximum Daylight.....	35"	35"	35"
Minimum Daylight.....	7"	7"	7"

Matched set of "V" blocks are included as standard equipment for both 100 and 150 ton presses.

The new Rodgers "Sixty"—60 ton Shop Press has the same features as the larger models—ideal for hundreds of uses. Write for literature.



# Rodgers Hydraulic, Inc.

HYDRAULIC POWER EQUIPMENT

Shop Presses



Crawler-Track Presses

Shop

Presses

Power Pump Units

Portable Presses

Power Pump Units

Portable Presses



C. & E. M. Photo  
Dogwood was placed in holes about 1½ feet deep and 2 feet in diameter.

## Dogwood Planted

(Continued from preceding page)

long, were driven flush with the ground at least 4 feet from the base of the tree. Notches were cut in the stakes near the top for fastening the guy wires. To prevent the wire from cutting into the trees, black corded rubber hose,  $\frac{1}{4}$  inch in diameter and 8 inches long, was used to secure the guys to the trees. After guying, the trees were trimmed by removing about 1½ feet of growth in order to offset the loss to the root system during the initial digging and the subsequent transplanting. This reduces the limb area which the roots have to feed and is necessary to insure the growth and life of the tree.

Another shorter section of the Blue Star Drive was also the scene of planting activity this spring. It was a 2-mile stretch of U. S. 22, or State Route 28, near Whitehouse in Hunterdon County. Here about 600 dogwoods and 300 other trees including oaks, maples, and gums were planted through the cooperative efforts of the Hunterdon County Community Garden Club and the New Jersey State Highway Department. At this location also the highway has a dual concrete pavement. But its 140-foot right-of-way makes possible a 50-foot-wide planted area as a central mall. Trees were planted both in this median strip and at the sides of the road beyond the shoulders, as they were at the other section of the Drive.

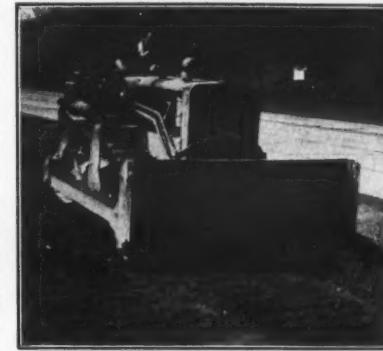
The full results of all this work naturally will not be observed until a lapse of about five years, when the trees have attained a greater growth and can show to their best advantage. By that time too it is hoped that the present two sections of the Blue Star Drive will have been extended along the full length of U. S. 22 crossing the state.

### New Parkway

With the end of the war, roadside de-

velopment in New Jersey is expected to take a more prominent part in new highway construction. The trend will be to provide wider right-of-ways so that slopes can be graded 4 to 1. This will enable the operation of power maintenance equipment such as mowing machines, which will mean a subsequent reduction in maintenance costs. The landscape labor force is expected to be increased from 135 to 275 men, although at the present time such labor is still difficult to obtain. With a larger crew the scope of roadside development can be broadened.

Plans are now being completed for construction of the first New Jersey state parkway, and informal planting and landscape development are provided for in the original highway-construction design. This north-south parkway will eventually be 140 miles long. It will extend from the New Jersey connection to the George Washington Bridge over the Hudson River near Clifton, N. J., to Cape May at the southern tip of the state. The parkway will



C. & E. M. Photo  
As part of the roadside development along Blue Star Drive in New Jersey, backslopes were flattened. Here a Caterpillar RD4 and 6-foot blade reduce a slope from 1½ to 4 to 1.

have at least a 300-foot right-of-way for six lanes of traffic and a 20-foot-minimum median strip. Opposing lanes will have greater separation wherever the cost of the right-of-way will permit more acquisition. This will reduce

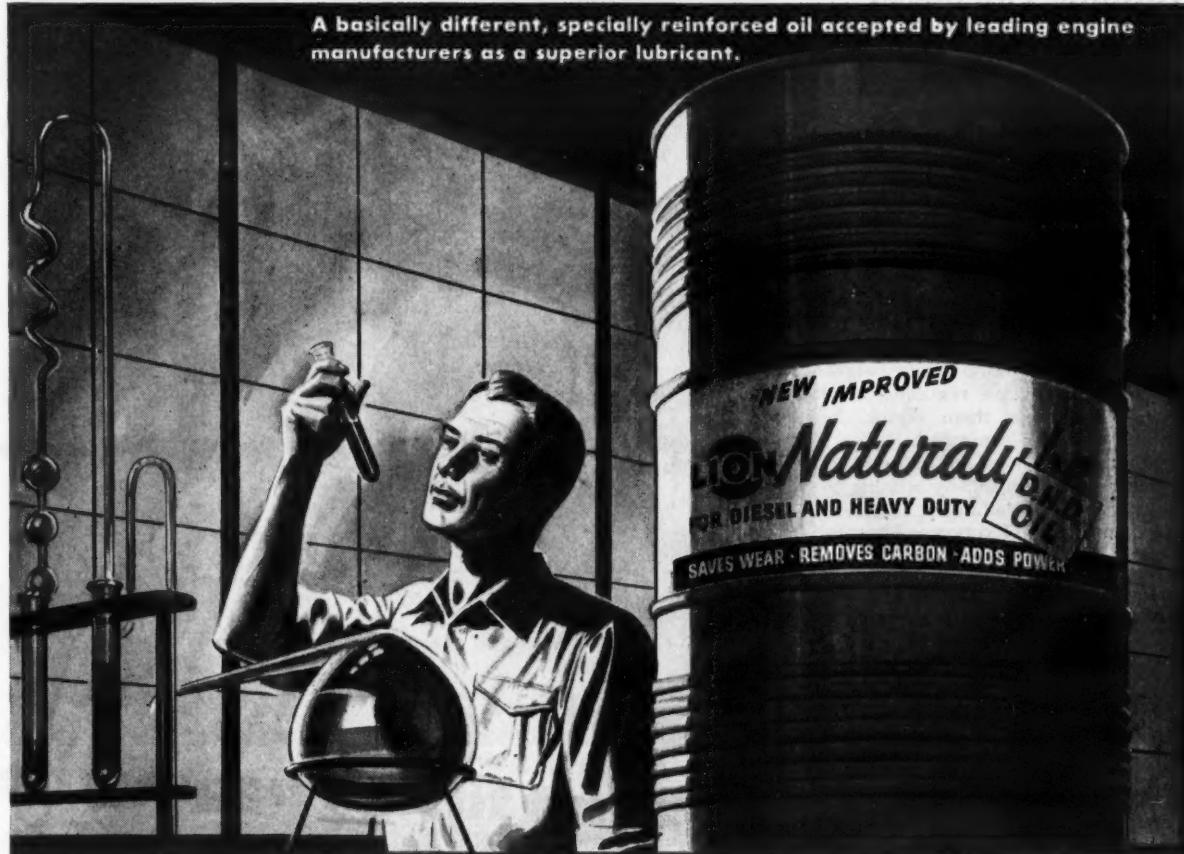
headlight glare and allow the new parkway to fit the existing terrain more easily. Construction is expected to start this year on the initial 7½-mile section of parkway from Cranford, Route 28, to Woodbridge, Routes 25 and 35.

### Personnel

The roadside development along the Blue Star Drive is under the supervision of Oliver A. Deakin, Parkway Engineer, and Robert S. Green, Supervising Landscape Engineer, of the New Jersey State Highway Department. Spencer Miller, Jr., is Commissioner, and Charles M. Noble, State Highway Engineer.

### Robins' Philadelphia Office

Effective September 1, the Philadelphia office of Robins Conveyors Inc., manufacturer of materials-handling machinery, will be consolidated with that of its parent organization, Hewitt-Robins Inc., at 401 No. Broad St., Philadelphia 8.



## RESISTS SLUDGE FORMATION REMOVES HARD CARBON REDUCES WEAR

Nature and science combine to make Naturalube D. H. D. the finest oil you've ever used, for special Lion processing of this basically different crude oil provides extra resistance to the formation of sludge and lacquer—the effects of heat and oxidation.

From Nature, Naturalube D. H. D. gets a tougher protective film... natural solvent properties that en-

able it to remove hard carbon... greater ability to penetrate to all moving parts of an engine and adhere to those parts even when engines are idle... and non-corrosiveness.

Ask your local Naturalube distributor about D. H. D. or write direct to Lion Oil Company, El Dorado, Arkansas.

For normal service, where D. H. D. is not required, use Naturalube Motor Oil (not so heavily reinforced).

Naturalube D. H. D. is supported by a positive money-back guarantee of satisfaction. If you don't believe it is the best oil you've ever used, Lion Oil Company will return your money.



**LION OIL COMPANY** EL DORADO ARKANSAS

### HYDRAULIC HOSE

#### COUPLED WITH PERMANENT OR REUSABLE COUPLINGS

Your hydraulically operated machinery is equipped with dependable and highly flexible hose assemblies when you use the ANCHOR brand. Our permanently applied coupling on high pressure hydraulic hose employs a patented ductile sleeve which gives it the strongest grip of any coupling.

Clamp type reusable couplings can be applied with two automotive wrenches, in field or shop, assuring maximum hose life.

High pressure, medium pressure, and low pressure hose is available in sizes from 3/16" I.D. to 1½" I.D. inclusive.

**ANCHOR COUPLING CO., Inc.**  
342 N. Fourth Street, Libertyville, Illinois  
Factory Branch  
1303 Cleverdale Ave., Detroit 4, Michigan

## Tractor Lays Drain In Three Operations

A single track-type tractor with its various supplementary attachments performed all the major construction tasks on a recent pipe-laying job. The Standard Construction Co. of Duluth, Minn., was awarded the contract to install a 36-inch tile pipe along the Northern Pacific Railway's right-of-way near St. Paul. A Caterpillar D4 diesel, fitted with a Hyster double-drum winch and a LaPlant-Choate bulldozer, did the job.

The winch was used with an A-frame and a dragline bucket to dig out the deep ditch required to install the pipe beneath the railroad tracks. The operator then unhitched the dragline, and used the other end of the tractor to bulldoze the pipe into the ditch. Next, he hooked up the winch cable to the pipe, and pulled it into place. All that was left to do was bulldoze the displaced earth into the fill.

## Hydraulic Two-Speed 50-Ton Journal Jack

Designed especially for such general high-lifting jobs as bridge work, a 50-ton hydraulic journal jack has been added to the line produced by the Buda Co., Harvey, Ill. The 50-ton unit is built in two models: 50-B-12 has a closed height of 12 inches and a rise of 7 inches; 50-B-26 stands 26 inches closed and has a 20-inch rise. Each unit has two jacking speeds: fast for raising light or medium loads, and standard for lifting capacity burdens. An easy pumping action raises the loads, which may be held indefinitely at any height. A simple control valve regulates their lowering and keeps them under the operator's complete command.

Details on these new additions to its jack line can be secured by writing to the firm. Say you read about the jacks in CONTRACTORS AND ENGINEERS MONTHLY.

## New Plant for Gar Wood

Gar Wood Industries has begun an expansion in the Detroit area with the purchase of a plant in Wayne, Mich., from the War Assets Administration. All Detroit operations are to be transferred there except the body plant which will remain on Connecticut

## IN THE CLEAR!



with a  
**ROSS SNOW PLOW**  
Plan now for your  
winter requirements.

In a ROSS Snow Plow, you have:

- Expert design and construction based on over 20 years experience
- Full hydraulic control
- Variety of sizes and types to fit your special needs.

Write for specifications and prices.

MANUFACTURED BY

**The BURCH Corp.**  
Crestline, Ohio



Pipe-laying operations are handled by a D4 tractor equipped with a Hyster winch and a LaPlant-Choate bulldozer. Left, the winch operates a dragline bucket to excavate the trench. Center, the pipe is pushed into the ditch by the bulldozer. Right, the winch cable pulls the pipe into place. Backfilling was done by the dozer.

Avenue.

Located on a 37-acre plot, 45 minutes from downtown Detroit, the new plant

is of modern construction and has 236,500 square feet of factory space. Equipment and attachments for motor trucks

and tractors will be among the Gar Wood products to be manufactured at the Wayne location.



**Here's the plant...**  
**...that fits all aggregate**  
**production requirements —**  
**...any quantity . . . any specification**

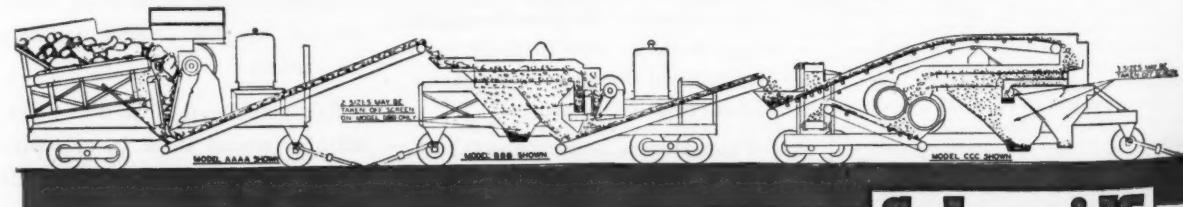
IT'S A Cedarapids Unitized Plant that will crush, size and wash rock or gravel to fit any specification from riprap stone to agstone. The complete set-up consists of a primary crusher unit, a secondary crusher unit, a roll crusher unit and a washing and sizing unit. Each unit is complete in itself and can be used alone or in any one of a dozen different combinations depending upon the pit or quarry and the finished product desired. A wide range of sizes of each unit makes it possible to have a plant

with almost any desired capacity. Choice of roll crusher, cone crusher, twin jaw crusher or hammermill provides still more flexibility.

You can start with the secondary jaw and roll units to produce crushed gravel and add the other units as your demands increase. Get the complete story from your nearest Cedarapids distributor and study the flow diagram below.

When buying a crushing plant — buy the best — buy Cedarapids.

**Iowa Manufacturing Company, Cedar Rapids, Iowa, U. S. A.**



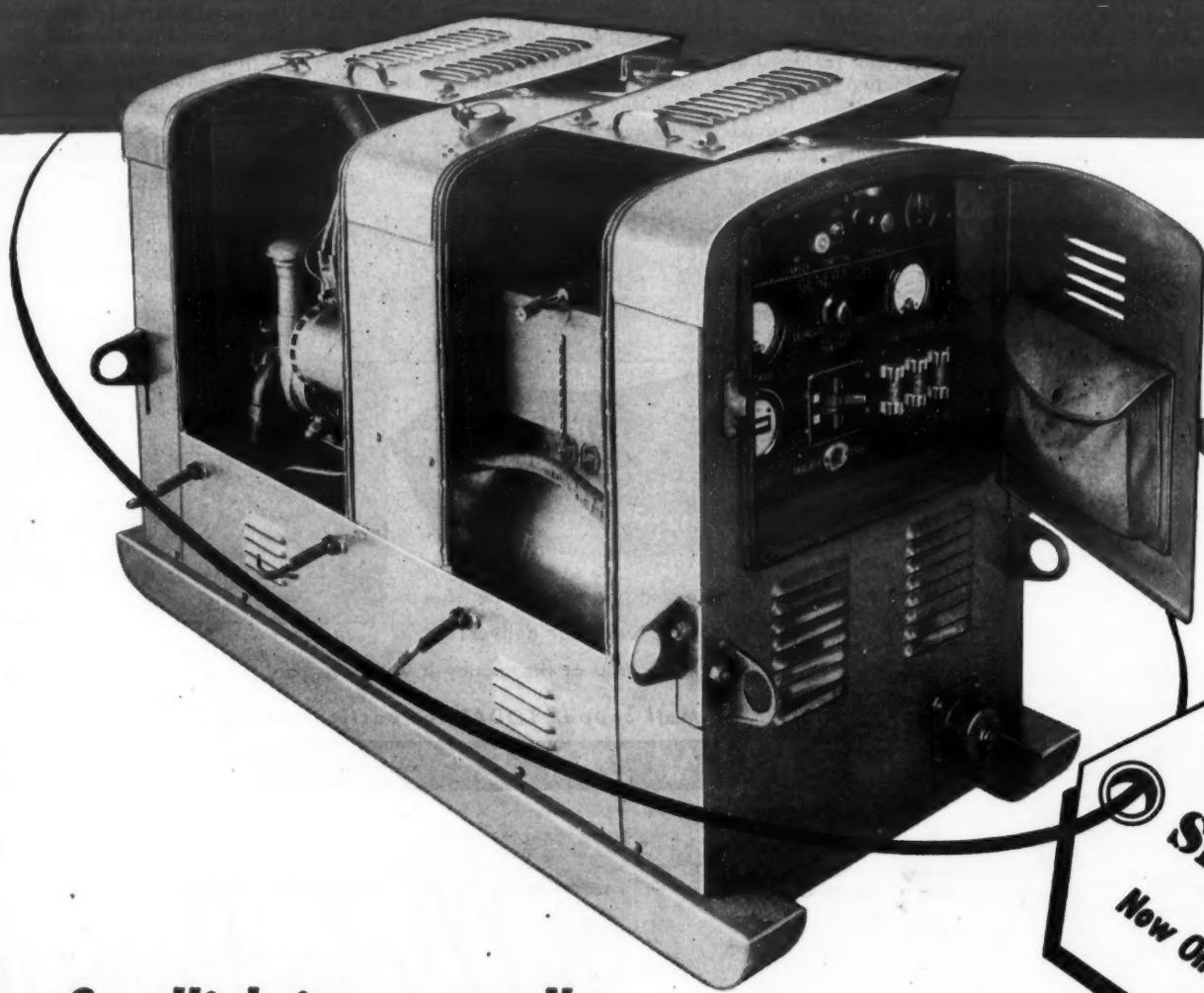
THE IOWA LINE of Material Handling Equipment Includes:

ROCK AND GRAVEL CRUSHERS	STRAIGHT LINE ROCK AND GRAVEL PLANTS	TRAVELING (ROAD MIX) PLANTS
BELT CONVEYORS—STEEL BINS	FEEDERS—TRAPS	DRAG SCRAPER TANKS
BUCKET ELEVATORS	PORTABLE POWER CONVEYORS	WASHING PLANTS
VIBRATOR AND REVOLVING SCREENS	KUBIT IMPACT BREAKERS	TRACTOR-CRUSHER PLANTS
		STEEL TRUCKS AND TRAILERS

**Cedarapids**  
Built by  
IOWA

PORTABLE STONE PLANTS  
PORTABLE GRAVEL PLANTS  
REDUCTION CRUSHERS  
BATCH TYPE ASPHALT PLANTS

# NOW AVAILABLE!



**For floodlighting, standby power, mobile use on construction jobs. Produces 3,000 watts of light.**

This 3 KVA all-purpose engine-generator set that serves as prime source of electricity or fits into present circuits as a standby unit is now available for immediate shipment. Built to U.S. Army specifications, the units have been used only for test runs or standby service. Priced below the original cost, this 3 KVA 3-phase or single-phase unit is sturdy and fully enclosed against weather.

**PARTS:** Ample supply of parts is available.

**PRICES SLASHED!**  
Now Only \$480

#### SPECIFICATIONS:

**ENGINE:** Gasoline, 4-cylinder Hercules model ZX8, develops 11 horsepower at generator speed.

**GENERATOR:** 3 KVA AC., 115, 120 or 125 volts, 3-phase or single-phase, 60-cycle at 1200 rpm, 50-cycle at 1100 rpm.

**EQUIPMENT:** Self-starter which operates on a vehicle-type, 6 volt battery (battery extra), oil filter, oil bath air cleaner, manual choke, gasoline gauge, gas strainer. **Control panel:** Main switch, circuit breaker and fuses, frequency meter, voltmeter and ammeter, charging ammeter, oil pressure gauge.

**WEIGHT:** 900 lbs. Compactly built, the unit consists of engine, generator, switch board, and gas tank, all mounted on skids for easy transportation.

**HOW TO BUY:** List price of \$480.00 f.o.b. Sidney, Nebraska, Anniston, Alabama or Los Angeles, California. Terms, cash; or 10% cash with order, balance sight draft bill of lading. 30% discount to dealers.

**THESE WON'T LAST — ORDER NOW! Write, wire or phone:**

**SOLD BY**

**GREENE-HALDEMAN COMPANY, INC.**

*World's Largest Chrysler Dealer*

1150 SO. FLOWER ST., LOS ANGELES 15

## Civilian Builders For Pacific Battle

What construction job in all the world has involved the greatest speed, size, and stakes? David O. Woodbury writes this answer in his book "Builders for Battle"—building the Pacific Naval Air Bases.

Speed? They were begun in 1939 and constructed in a race against the Japanese attack, which it was even then realized might be imminent. Stakes? The Pacific campaign of World War II, and possibly America's future. Size? Eight major construction companies joined forces to do the job: Turner Construction, Raymond Concrete Pile, Hawaiian Dredging, Morrison-Knudsen, J. H. Pomeroy, W. A. Bechtel, Utah Construction, and Byrne Organization. They built on the Hawaiian Islands, Midway, Johnston, Palmyra, and Samoa, the bases from which all the later bases were developed.

Specifically, the contractors had to remove thousands of feet of coral. They

had to build land where none existed before, and tie 52 islands into one big piece of it. They had to make concrete landing ramps where there was nothing to make the concrete out of. They had to carve a series of multiple oil vaults out of solid rock. They were up against strangling red tape, intolerably long supply lines, "ten million square miles of watery nature, and four quick years packed full of fast-ticking seconds. And, of course, the Japs".

Mr. Woodbury has somehow detailed these complex engineering feats without losing the sense of high adventure or its rapid pace. Nor does he let his reader forget that men were involved in this adventure—whether Johnston pioneers who "would bite a stick of dynamite in two rather than cut it with a knife", or men who couldn't deal with their leisure and succumbed to Midway Madness. And Lili Rethi and Louis Ruyl have added much to the story with their sketches. Published by E. P. Dutton & Co., New York, the book sells for \$7.50.

If for no other reason, contractors and engineers will be interested in "Builders for Battle" because it reaffirms the inventive genius and ingenuity of American private industry, its ability to cooperate in teamwork—on this occasion with the Navy.

### New Tractor Cab

Protection in all kinds of weather is afforded the tractor driver if his machine is fitted with the Tractorcab, says its manufacturer, the Automatic Equipment Mfg. Co. of Pender, Nebr. Built

of lightweight aluminum, the unit mounts on many types of tractors. Lucite windows give the operator wide vision, at the same time keeping out cold, rain, snow, and dust. The cab is roomy enough to hold a heater, radio, tools, and other equipment. It has a self-closing rear curtain which permits easy access to levers.

A full description of this comfort-giving accessory can be secured from the manufacturer. Write the Automatic Equipment Mfg. Co. and ask for details on the Tractorcab as reported in this magazine.

### Does the Complete Mixing and Paving Job

The Moto-Paver mixes, spreads and lays any type of mixed-in-place bituminous material to any road width, thickness and crown condition. No separate loader, spreader or other paving equipment is required—no trailer to haul the machine from one job to another.

The Moto-Paver does the complete mixing and paving job, and travels from one job to another under its own power. Paving speed is from 4 to 50 feet per minute, road speed up to 18 miles per hour. Mixing capacity 100 to 120 tons per hour. Bulletin MP-46, giving complete information and specifications, will be sent on request.



Resurfacing Michigan Road  
with the Moto-Paver

Also Builders of Portable and Stationary Batch Mix Plants of All Types and Capacities

**Hetherington & Berner Inc.**  
731 KENTUCKY AVE. • INDIANAPOLIS 7, IND.



**Hetherington & Berner**

## Specialized Jack Line For Highway-Shop Needs

Highway-department shop superintendents and contractors' garage superintendents will be interested in a 12-page catalog issued by the Walker Mfg. Co. to show its line of jacks. Walker makes lifting apparatus for all automotive needs, both on-the-road and in-the-shop.

Hydraulic service jacks that feature a "pistol-grip" handle are built in capacities from 2 to 10 tons. Frequently applicable are such specialized units as the Walker transmission jack and the unit lift for removing transmissions,

differentials, axles, brakes, etc. Steel horses are another item built by Walker for the fleet shop. Walker also supplies a wide range of hydraulic and mechanical road jacks.

Readers of CONTRACTORS AND ENGINEERS MONTHLY can obtain copies of the Walker jack catalog by writing the Walker Mfg. Co. of Wis., Racine, Wis.

### Make Your Tires Last

There are three factors within the control of the equipment operator which determine the degree of service that will be received from off-the-road tires and, therefore, their cost per mile

or per hour. The B. F. Goodrich Co. points this out in a new brochure on tire use.

How these factors—load, inflation, and operating conditions—can be controlled for the best return is outlined in a series of basic and simple suggestions. The booklet also carries charts of recommended tire practice for various conditions. The firm's line of Silver-town tires for contractors' equipment is also presented.

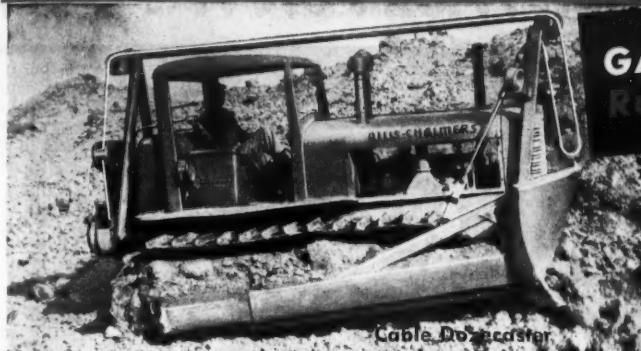
Copies of this 43-page brochure, punched for a loose-leaf cover, can be obtained from The B. F. Goodrich Co., Akron 18, Ohio. Mention this notice and ask for Catalog 5-7207-GP.

## Bucket Firm Acquired By Pettibone Mulliken

The Daniels Murtaugh Co. of Cedar Rapids, Iowa, manufacturer of heavy-duty dragline buckets ranging from 2 to 10-cubic-yard capacity, has been acquired by the Pettibone Mulliken Corp. The latter already makes dragline buckets in smaller sizes.

J. P. Murtaugh, Vice President and General Manager of the acquired firm, will represent Pettibone Mulliken on the west coast. P. V. Larsen, Sales Engineer and Secretary of the Murtaugh organization, will represent Pettibone Mulliken in serving the coal industry.

# Down-to-Earth Engineering



Cable Dozer



Heavy-Duty Cable Ripper



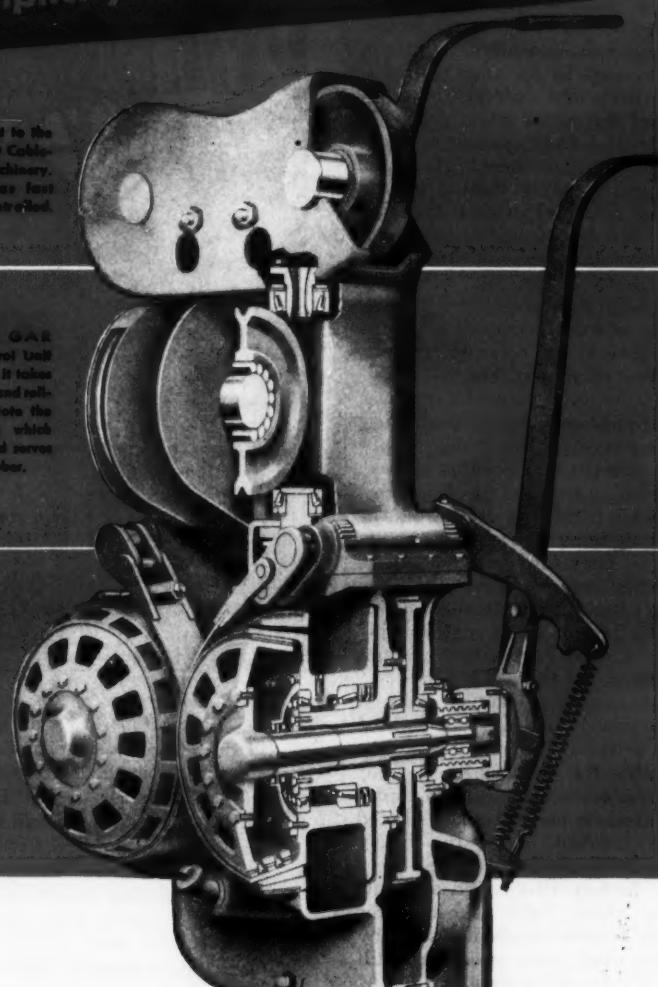
Cable Scraper

### GAR WOOD Cable Controls Feature Rugged Simplicity and Direct Action Pull

The cable goes direct to the job in GAR WOOD Cable-Controlled Road Machinery. As a result, it has fast action, positively controlled.

The job-proved GAR WOOD Cable Control Unit (right) has everything it takes for smooth operation and reliable performance. Note the sturdy steel housing which prevents distortion and serves as a lubrication chamber.

Overide catches and servo-type, self-centering brakes cool themselves and are readily accessible. Roller bearings throughout and spur-type gears keep adjustments to a minimum.



PROVED through the years on the toughest of jobs. Made more rugged than ever by the lessons learned in war action on every front, from Guadalcanal to Okinawa and from Oran to Berlin.

GAR WOOD Road Machinery and the famous GAR WOOD Cable Control Power Unit offers practical design and sound construction, well engineered and honestly built—equipment that holds together and can be operated with an absolute minimum of down time. If it's GAR WOOD, it's good.

See your Allis-Chalmers dealer. He'll be happy to give you all the facts and show you Gar Wood Earth Moving Equipment on the job in your own vicinity.



Gar Wood 2-Wheel Hydraulic Scraper and Bulldozer



Gar Wood Hydraulic Dozer

OTHER GAR WOOD PRODUCTS: HOISTS AND BODIES • TANKS •  
WINCHES AND CRANES • HEATING EQUIPMENT • MOTOR BOATS

### GAR WOOD ROAD MACHINERY WITH ALLIS-CHALMERS DIESEL POWER



Sold Through  
ALLIS-CHALMERS  
Dealers Everywhere  
ROAD MACHINERY DIVISION  
GAR WOOD INDUSTRIES, INC.  
DETROIT 11, MICHIGAN

## Increased Portability Needed for Equipment

One Answer for Greater Speed  
In Construction and Maintenance  
Programs Is Truck Mounting and  
Use of Power Take-Offs

AS America surveys the damage wrought to her highways and streets during the war years, the vast backlog of maintenance work, and the huge construction program ahead, it is obvious that she needs faster moving, more portable construction and maintenance equipment. One answer to this need is suggested by Paul H. Davey, President, Davey Compressor Co. It is the mounting of more equipment on motor trucks and driving it directly from truck engines through power take-offs.

Mr. Davey points out that ever since the mechanization of construction, portability has been the main problem of both equipment manufacturers and users. Equipment mounting has progressed from skids to steel wheels, then to hard-rubber tires, and finally to pneumatic-tired spring-mounted trailers. These changes were, of course, made possible by improved design, weight reductions, and increased use of welding, as well as by vast improvements in wheels and undercarriages.

Advent of the motor truck naturally resulted in the truck mounting of a wide variety of equipment. However, such applications were limited by the inability of standard trucks to carry the weight of many pieces of equipment. Also, the overall equipment dimensions were frequently greater than those of even the most extensive truck bodies. This was particularly true of air compressors, generators, concrete mixers, pumps, street sprinklers, etc.

Faced with this situation, it was logical that engineers should focus their attention upon weight and size reductions. The obvious solution, they agreed, lay in the elimination of the secondary engines which furnished driving power for the equipment. These were large and heavy. They often weighed more and occupied more space than the equipment itself. Why—when there was a perfectly good truck engine available—should it be necessary to mount another engine on the truck body?

From this reasoning evolved the first light-duty power take-offs. Operated through a series of meshing gears, they were suitable for winches, hoists, etc. But meshing gears wore rapidly under heavy continuous loads; bearings failed and cases cracked under the heavy strains. Consequently, failures were frequent. In fact, ill-advised attempts to employ these light take-offs for heavy-duty service resulted in so many breakdowns that some users are still skeptical of take-off operation.

### WON'T QUIT or cause time out



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward  
Company

32-36 Dey Street  
New York, N.Y.

**Hayward Buckets**



As construction equipment becomes more mobile, many concrete mixers are now truck-mounted and operated by power take-off.

With the introduction of the split-shaft type of take-off about 15 years ago, power take-off operating troubles decreased. Today, quality drives of this type are as dependable as is separate auxiliary engine power, Mr. Davey says.

### Modern Power Take-Offs

But, enough for past history. Let's look at today's power take-offs and the equipment portability which they make possible. For some reason the idea has sprung up that power take-offs are difficult to install. This is not so, Mr.

Davey states. They can be handled by any first-class garage mechanic, and there is nothing complicated about the installation operation.

As a matter of fact, just prior to the war, several Davey units were sent to South Africa for installation in airport service trucks. The crew which installed them had never previously seen a split-shaft take-off. Also, the trucks were of special-make right-hand drive, and it was impossible to machine-mount parts to the tolerances ordinarily achieved. However, with the aid of blueprints and a brief description of operating principles, they installed the take-offs without difficulty, Mr. Davey reports.

The split-shaft power take-off is installed as an integral part of the truck drive shaft to the rear of the transmission. It is supported by self-aligning pillow blocks, attached to a cross member of the truck frame, thereby relieving torsional strains.

These take-offs can ordinarily be in-

(Continued on next page)

## PUSH BUTTON CONTROL FOR A GIANT



Easy control, always an important feature of Ransome design, is carried a step further in the latest models 56S, 84S, and 126S Blue Brute "Big" Mixers. A new 4-way solenoid valve has been added for improved remote control of the discharge chute, considerably simplifying operation. Merely pressing a button gives operator instant control over chute—allowing faster, more accurate discharge into truck mixers, hoist buckets or hoppers.

### OTHER IMPROVEMENTS INCLUDE:

Drum rollers turning independently on two Timken roller bearings . . . Extra-heavy roller shafts of heat-treated alloy steel, adjustable to allow for wear and to keep the drum always

properly centered . . . Countershaft mounted on self-aligning bearings . . . Drum roller tracks machined to a true circle, for smoother operation and longer service life . . . Enclosed V-belt drive, with helical gears running in an oil bath . . . Ransome's exclusive mixing action for fast, thorough mixing.

These are a few of the reasons why Ransome Blue Brute "Big" Mixers are first choice for low-cost, trouble-free performance in central mixing plants and on so many big construction jobs. Your nearby Worthington-Ransome Distributor has the whole story. Call him and he'll be glad to give you additional proof that *there's more worth in Worthington-Ransome*.

ME-15

### KNOW YOUR

## BLUE BRUTES

Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute Mixers and other construction equipment can put your planning on a profitable basis. His name is listed on Page 35. Blue Brutes include:

### RANSOME EQUIPMENT

Pavers, Concrete Spreaders and Finishers\*, Portable and Stationary Mixers, Pneumatic Placing Equipment, Truck Mixers, Plaster & Bituminous Mixers and Accessories.

### WORTHINGTON EQUIPMENT

Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Contractors' Pumps\* and Accessories.

\*To be announced.

## Buy BLUE BRUTES



Truck Mixers  
Capacities:  
2, 3, 4½ cu. yds.



Portable Mixers  
Capacities:  
3½, 6, 11, 16, 28 cu. ft.



Big Stationary Mixers  
Capacities:  
28, 56, 84, 126 cu. ft.



Pneumatic Placer  
Capacity:  
7, 14, 28 cu. ft.

**WORTHINGTON**  


Worthington Pump and Machinery  
Corporation, Worthington-Ransome  
Construction Equipment Division,  
Holyoke, Mass.

## Increased Portability Needed for Equipment

(Continued from preceding page)

stalled in any truck of 1½-ton or more capacity with a wheelbase of 134 inches or more for cab-over-engine models, and of 157 inches or more for conventional cab trucks. On some trucks, installations can be made in cab-over-engine models with wheelbases as short as 117 inches, and in conventional wheelbases as short as 134 inches.

A shift lever in the cab controls take-off operation, instantly shifting the drive from the rear axle to the power take-off mechanism. A series of V-belts, or chain drive, connects the power take-off to the truck-mounted equipment.

In addition to the single-drive mechanism, split-shaft take-offs are available in simultaneous and double-drive models. The simultaneous drive permits individual operation of truck, or of driven equipment, or of both simultaneously.

### Worthington-Ransome Blue Brute Distributors

See ad on page 34 for list of equipment in each line

#### Worthington-Ransome Distributors

Ala., Birmingham, Construction Equip. Co.  
Ala., Montgomery, Burford-Tothakes Tractor Co.  
Alaska, Anchorage, Airport Mac. & Storage Co.  
Ariz., Phoenix, Lee Redman Co.  
Cal., San Francisco, Coast Equip. Co.  
Cal., Los Angeles, Golden State Equip. Co.  
Colo., Denver, Power Equipment Company  
Conn., New Haven, Wilhem-Davies Co., Inc.  
Fla., Miami, Allied Equip., Inc.  
Fla., Orlando, Highway Equip. & Supply Company  
Tampa, Epperson & Company  
Ga., Atlanta, Tractor & Machinery Company  
Ida., Boise, Olson Manufacturing Co.  
Ill., Chicago, Chicago Construction Equip. Co.  
Iowa, Cedar Rapids, McNeil Machy. & Supply Co.  
Ky., Harlan, Croushon Equip. & Supply Co.  
Maine, Portland, Maine Truck-Tractor Company  
Mass., Allston, Boston, Clark Wilcox Co.  
Mich., Muskegon, Lakeshore Machy. & Supply Co.  
Minn., Minneapolis, Phillipi-Murphy Equip. Co.  
Miss., Jackson, Jackson Road Equip. Co.  
Mo., Clayton, The Howard Corporation  
Montana, Billings, Interstate Truck & Equip. Co.  
Helena, Card Eng. Works  
N.J., No. Bergen, American Air Corp. Corp.  
N.M., Albuquerque, Bud Fisher Co.  
N.M., Roswell, Smith Machy. Co.  
N.Y., Albany, Milton-Hale Machinery Company  
New York, Hodge & Hammond, Inc.  
N.Y., Olean, Freeborn Equip. Co.  
N.Y., Syracuse, Milton-Hale Mach. Co.  
N.C., Raleigh, Smith Eq. Co.  
N.D., Fargo, Smith Commercial Body Works, Inc.  
O., Cincinnati, Carroll-Edwards Co.  
Okla., Oklahoma City, Townsco Equip. Company  
Ore., Portland, Andrews Equip. Service  
S.C., Columbia, Smith Equipment Company  
Tenn., Knoxville, Dempster Bros., Inc.  
Tenn., Nashville, Dempster Bros., Inc.  
Tenn., Memphis, Independent Tractor Co.  
Tex., Amarillo, T. W. Carpenter Equip. Co.  
Tex., Dallas, Shaw Equip. Co.  
Tex., Houston, Contractors Equip. Sales & Service Corp.  
Tex., San Antonio, Patten Machy. Co.  
Tex., Tyler, D. M. McClure Equip. Co.  
Utah, Salt Lake City, J. K. Wheeler Mach. Co.  
Vt., Barre, A. M. Flanders, Inc.  
Wash., Spokane, Andrews Equip. Service  
Wisc., Milwaukee, Drott Co. Inc.

#### Ransome Distributors

D.C., Washington, M. A. Doetsch Mach. Company  
Ill., Chicago, Thomas Hoist Company  
Ind., Fort Wayne, American Steel Supply Corp.  
Ky., Paducah, Henry A. Petter Supply Company  
La., New Orleans, Ole K. Olson Company  
Md., Baltimore, Stuart M. Christhifl & Company  
Mich., Detroit, T. G. Abrams  
Mo., Kansas City, Brown-Strauss Corp.  
Neb., Lincoln, Highway Equip. & Supply Co.  
N.Y., Buffalo, Murray Equip. Co.  
O., Cleveland, H. B. Fuller Equip. Company  
Pa., Philadelphia, Giles & Ransome  
Pittsburgh, Arrow Supply Company

#### Worthington Distributors

Ark., Fort Smith, R. A. Young & Son  
Little Rock, R. A. Young & Son  
Ind., Indianapolis, Reid-Holcomb Company  
Ky., Louisville, Williams Tractor Company  
La., New Orleans, Wm. F. Surgi Equip. Company  
Md., Baltimore, D. C. Elphinston, Inc.  
Mass., Cambridge, Field Mach. Company  
Mich., Detroit, W. H. Anderson Co., Inc.  
Flint, Granden-Hall & Company  
Mo., Kansas City, Mach. & Supplies Co.  
N.Y., Buffalo, Dow & Co., Inc.  
New York, Air Compressor Rental & Sales  
O., Cleveland, Gibson-Stewart Company  
Toledo, The Kilcorse Mach. Co.  
Pa., Allentown, H. N. Crowder, Jr., Inc.  
Easton, Sears & Bowers  
Harrisburg, American Equip. Corp.  
Oil City, Freeborn Equipment Company  
Pittsburgh, Atlas Equip. Corp.  
Pa., Phil. Metalweld, Inc.  
Wilkes-Barre, Ensminger & Company  
Texas, El Paso, Equip. Supply Company  
Va., Richmond, Highway Mach. & Supply Co.  
Wash., Seattle, Star Machinery Company  
Wyoming, Cheyenne, Wilson Equip. & Supply Co.

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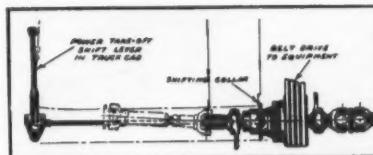
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Equipment Division  
Holyoke, Massachusetts

taneously. The double drive allows operation of the truck alone, or of either of two pieces of driven equipment individually, or of both pieces of driven equipment simultaneously.

#### Features

There are five main advantages claimed for power take-off use. These are as follows:

1. It permits truck mounting of larger, heavier equipment and equipment combinations. Elimination of the auxiliary engine equipment often reduces the overall size and weight by as much as 60 per cent. It is estimated that 75 per cent of the equipment driven through power take-offs could not be mounted on trucks if auxiliary engines were required. Such combinations as complete mobile machine shops could not be assembled on a single truck



This sketch shows how a power take-off fits into the truck's drive shaft and is controlled by a shift lever located in the cab.

without the use of heavy-duty power take-offs.

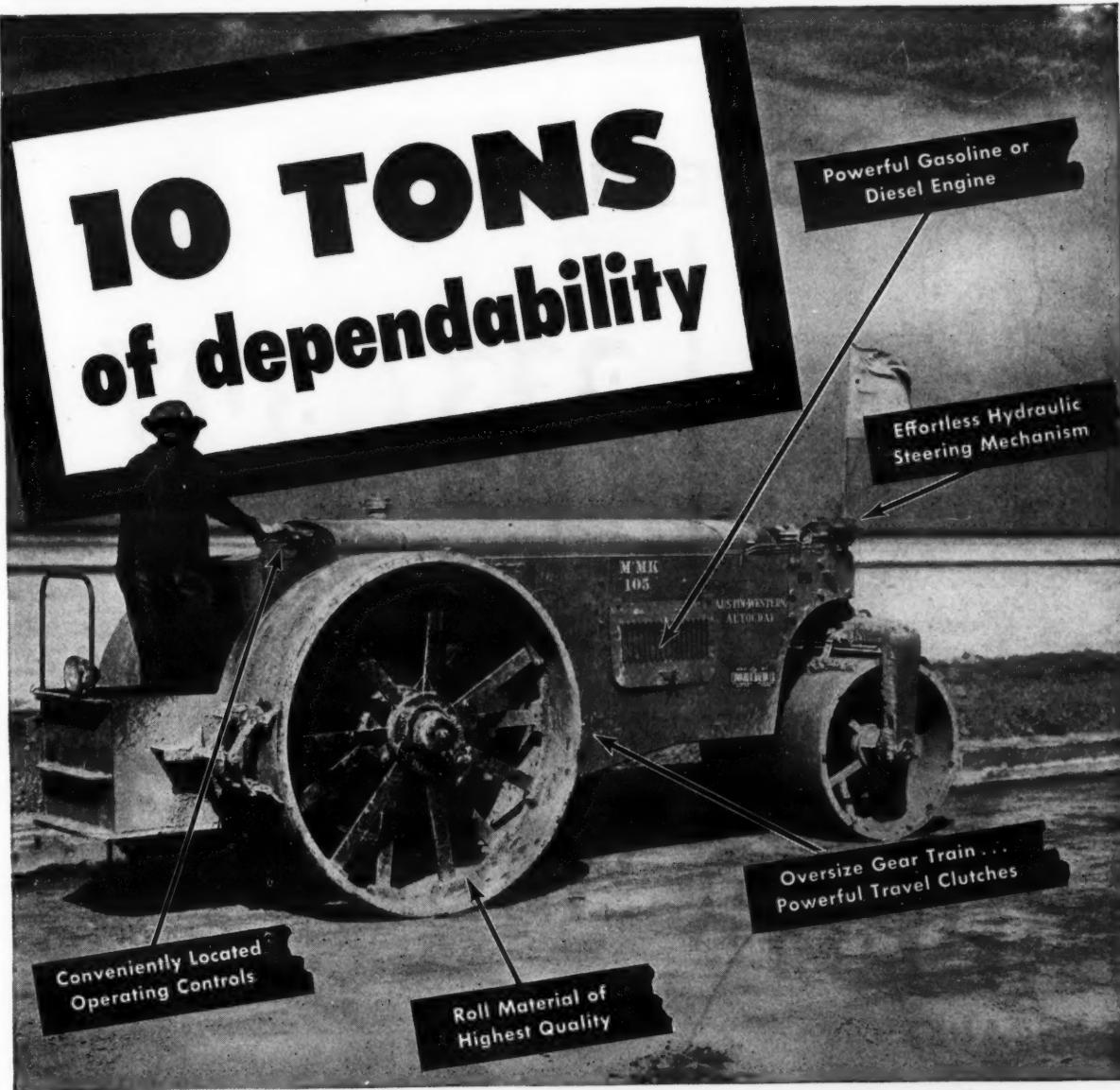
2. It reduces original investment because one engine does the work of two; the price of one engine assembly is saved. In air compressors this economy is particularly apparent. A 105-cfm compressor driven by a power take-off on a new truck costs only slightly more than a skid-mounted or trailer machine of the same capacity. In larger sizes,

the comparison is even more advantageous.

3. It cuts maintenance and operating expense. Upkeep cost of a power take-off is only a fraction of that of an auxiliary engine, it is reported. Elimination of the second engine reduces the truck weight and results in lower truck license fees. Reduced weight also means less tire wear and improved gasoline mileage. Service and service parts for truck engines are much more universally available than for industrial engines, and at lower cost.

4. It saves man-power and time. Because one lever in the truck cab controls the power take-off, it is possible for the driver to handle the operation of all equipment on his truck, thus eliminating the special equipment operator. In winter, the truck engine is

(Concluded on next page)



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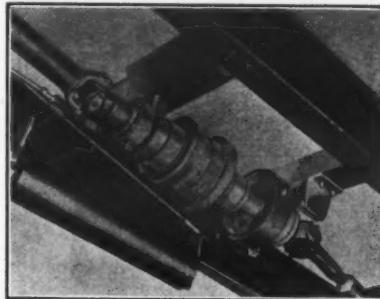
## Increased Portability Needed for Equipment

(Continued from preceding page)

usually warm by the time it arrives on the job; this prevents the headache of trying to start a stiff industrial engine in cold weather.

5. It permits increased use of the truck. The space and carrying capacity gained by power take-off use can be utilized for the transportation of men, tools, and materials. With a power take-off, one truck can frequently do the work of two.

As manufacturers and users become increasingly aware of the advantages of power take-offs, the use of take-offs is increasing constantly. A recent survey of more than 500 construction truck owners, operating 16,000 trucks, indicates that 43 per cent definitely want power take-offs in their new trucks. About 80 per cent of the highway departments listed take-offs as definite "musts".



The power take-off, here designed for chain drive, is installed as an integral part of the truck drive shaft.

Therefore, road builders, contractors, state and county maintenance organizations—in fact, all who will benefit by greater equipment speed and portability—might well investigate power take-off operation before investing in new equipment.

The National Safety Congress will be held October 7-11 in Chicago.

## Liners Replaceable

### On Dredge-Pump Shell

Increased service life is said to result to dredge pumps fitted with the lined pump shells produced by Meckum Engineering, Inc., of Chicago. Built for pumps having discharge-pipe diameters from 8 to 30 inches, these shells save in repair costs because of their replaceable liners, the manufacturer says.

The pump housing is fabricated from electrically welded steel plate. A hydraulically correct involute shell contour is said to give maximum pump efficiency. And the unit is given extra strength to resist high pressures by steel ribs welded around the housing. The upper half of the shell can be removed when replacing liner segments without disturbing the discharge outlet on the bottom shell.

The shell liner segments are made of alloy iron and have great resistance to abrasion. They have a Brinell hardness rating of 500 or better, Meckum says. Precision fit in the housing is assured

by pregrinding these segments to accurate templates, the firm states. A cushion is formed between the housing and segmental liner with sand packs. Tapered gaskets eliminate machining of liner segments.

How these pump shells can serve your dredging needs is explained in a bulletin available from Meckum Engineering. Write the firm at 53 W. Jackson Blvd., Chicago 4, Ill., and mention this notice.



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# Scarce Equipment A County Problem

## A "Hold-the-Line" Policy Of Upkeep and Maintenance Keeps This County's Roads In Usable Condition

IT might as well have been 14,000,000 miles between Florence, Ariz., and Peoria, Ill., during the years 1942-1946—so far as new equipment was concerned. There just wasn't any. How Pinal County in Arizona managed to get along through those four hectic years is the story of a maintenance shop. And it explains in part why County Engineer Louis O. Fiscel now has a little gray in the few hairs on his head.

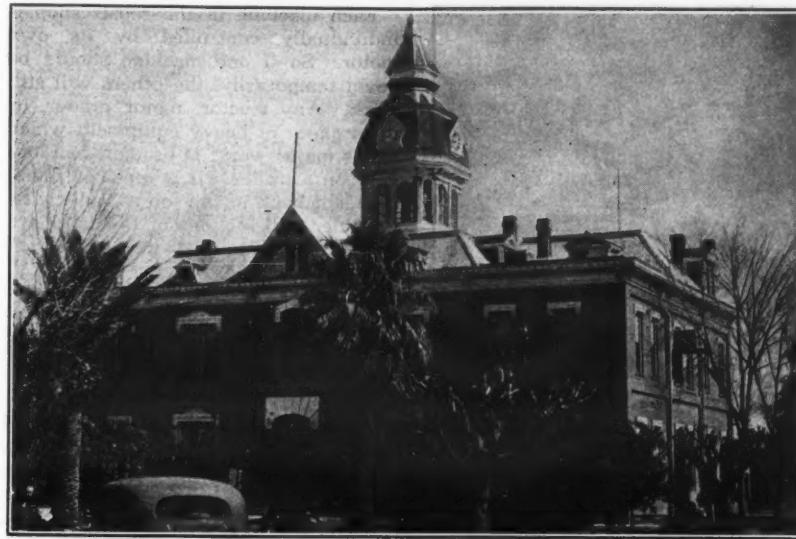
Pinal County, southeast of Phoenix, is an agricultural center. Its 5,436 square miles also support many herds of beef cattle and contain a few good copper mines. It is a land of plains, of irrigated fields and arid desert, of lofty mountains and saguaro cactus. Nearly 900 miles of county-maintained roads traverse it. Each mile of these roads is a producing one, an asset to the United States. For Pinal County gives to the nation instead of taking away. It is one of the heavy vegetable-producing districts of America.

### Road Characteristics

Pinal County's roads are mostly of two types: (1) approximately 400 miles of surfaced construction, either natural or stabilized with gravel or caliche, and (2) 450 miles of graded and drained natural earth. The County also maintains 27 miles of oil-surfaced road, and 6 miles of oil and concrete street surfacing in unincorporated towns.

Although situated in a part of the state where hot dry weather is the rule, Pinal County must also cope with a drainage problem. When rain falls, it usually comes down hard and in localized areas. Unless adequate drainage is provided, the floods caused by such rains cross highways and cut away huge chunks. That is one of Mr. Fiscel's problems. Corrugated-metal pipe and timber for bridges have not been easy to procure during the war years. And it has been a rather extensive job to put in rock dips on the county roads to take care of drainage. Mr. Fiscel has followed a policy of getting as much corrugated-metal pipe as possible, and installing it where it was needed most. Dips are not very desirable from his point of view.

Any road-building or maintenance program there must take into account



C. & E. M. Photo

The office of County Engineer Louis O. Fiscel is in this courthouse, which dates from the Indian-fighting days of the 1870's and '80's.

the prevalence of native road-building materials over most of the county. The

native gravel and sand found in washes is excellent material for stabilizing the surface of county roads. Natural deposits of caliche are also often used. Pinal County uses a Barber-Greene loader and a  $\frac{3}{4}$ -yard Bay City shovel with a fleet of ten dump trucks, to load and haul road material. Borrow pits have been located throughout the county to keep hauls down to a minimum.

One Allis-Chalmers, six Galion, one Austin-Western, and one Caterpillar motor grader are used in spreading this material and maintaining finished roads. Two Caterpillar RD6's with mounted bulldozers, a 6-yard Carryall scraper, and six Wooldridge trailbuilders mounted on Allis-Chalmers tractors, are used in maintenance, betterment, and new construction.

### Pinal County Organization

The work of the Pinal County Highway Department is directed by the County Engineer, who has his office in the courthouse at Florence. Although

(Concluded on next page)

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C. &amp; E. M. Photo

The Pinal County, Ark., maintenance shop, seen from the yard, has made possible continued highway work in the face of equipment and parts shortages.

## County Problem

(Continued from preceding page)

the county is divided into supervisorial districts, the maintenance program is set up to cover the county as a whole. A specified mileage is assigned to the various maintenance crews. Equipment is moved about and used where needed most, regardless of the supervisorial districts. About 450 miles of the county system is in the Casa Grande Valley Area (Supervisorial District No. 3). So about 45 per cent of the road budget is spent there.

The annual operating budget is approximately \$150,000. This is not a very large budget for 900 miles of road. In the last fiscal year, \$56,945 of this budget came from the state gasoline taxes collected within the county, 1½ cents of the 5-cent tax being returned to the counties. The remainder was secured from a small ad valorem road-tax levy of \$0.0756 per \$100 assessed valuation, and from part of the county's share of the state sales tax.

This money is spread out over the entire road system. Twelve road-maintenance crews totaling 28 men, a force of 5 men who work in the county repair shop at Florence, and the office force of the County Engineer, Clerk, and Road Foreman, comprise the Highway Department personnel. Crews as well as shop and office forces work a 48-hour week, excepting state holidays.

### County Repair Shop

In back of the county courthouse at Florence is a repair shop for the upkeep of county road equipment. This shop is the reason Pinal County managed to maintain its equipment all through the trying period when new machines were not available, and parts were almost equally hard to get.

In addition to the equipment already mentioned, the list of machines repaired by this shop and its small force of men includes the following: 2 equipment trailers, 8 pulled graders, an International wheel tractor with a mower and post-hole digger, a Bucyrus-Erie and an 8-cubic-yard Wooldridge scraper, a shop-made chat spreader, a 16 x 16-inch Cedarapids roll crusher, a Cedarapids rock-screening plant, a Bay City ¾-yard shovel, a 10-S Jaeger paver, a 7-S Jaeger concrete mixer, road rooters, water pumps, paving breakers and jackhammers, a Worthington 105-cfm compressor, and a fleet of 12 pick-up trucks.

In the days of scarcity, a broken-down machine was likely to wait three and four months for spare parts unless something drastic was done. During those days the Pinal County repair shop turned out many shop-made parts which helped to keep the machines going. The shop regularly made parts such as a dipper lip for the Bay City machine, bulldozer-frame supports,

Each machine in the repair shop is individually controlled by its own motor. So if one machine should be down temporarily, the others will still work. Any tractor, motor grader, or other piece of heavy equipment which needs major work, is brought to Florence on a trailer. It is repaired there, and sent back to the job as quickly as possible. All sections of Pinal County can be reached in a 100-mile drive from the county seat.

The county repair shop has this list of equipment available, which explains why it was able to keep its heavy equipment workable:

- 1 Robertson No. 4 power hack saw
- 1 Buffalo forge
- 1 South Bend 9-inch precision lathe
- 1 Carroll & Jamieson 14-inch machine lathe
- 1 Malsbury steam cleaner
- 1 Smith welder
- 1 drill press
- 2 Rush brake-band machines
- 1 Delta drill
- 2 Lincoln 200-ampere welding machines
- 1 Manley 60-ton hydraulic press
- 1 Black & Decker 10-inch bench grinder
- 1 oxyacetylene welding outfit
- 1 grinder
- Miscellaneous bench vises, small tools

The repair shop is under the super-

vision of Hugh Hager, Shop Superintendent. Hager recently filled the need for a truck crane by building one in the shop. An old FWD truck was used, and the hoisting engine and gears were rigged up by the shop mechanics. Even the boom was made from scrap channel iron. Hager admits it isn't a pretty machine, but it will move around the Florence yard and pick up 3-ton loads. That fills the bill so far as he is concerned.

### Plans and Personnel

The new Federal-Aid program will help Pinal County, no doubt. Mr. Fiszel has already done some planning, and he has a good idea where secondary roads are needed most at the present time.

Mr. Fiszel is assisted in the Pinal County Highway Department by Hugo Schultz, Road Foreman, and Elva Weaver, Clerk. The Supervisors of the three districts are Milton J. Backstein in the Ray Area, J. W. Spray in the Superior Area, and Robert Denton in the Casa Grande Valley Area.

sheaves, and pins. Some really fine work was also turned out by lathe, and by building up parts by welding.

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## Stabilized Subgrade, Hot-Mix for Runways

(Continued from page 2)

(some stripping and removal of topsoil had been completed before V-J Day), he had the three 12-yard Tournapull Super C's and the three 16-yard Euclids with Cummins diesel engines handling the stripping and removal of 85,000 cubic yards of topsoil. These units were also used along with one 8-yard and two 12-yard LeTourneau scrapers with Caterpillar D8 tractors in handling the 400,000 cubic yards of unclassified excavation, all of which involved  $\frac{1}{2}$  mile of overhaul.

The soil at MacDill Field is of the sugar-sand type so often encountered in Florida. Completely lacking in stability, sugar-sand subgrades provide poor foundations for either runways or highways. In some areas in the state, roads built through sugar-sand have displayed a decided tendency to "float". Because the runways and taxiways at MacDill Field are designed to carry gross loadings of 120,000 pounds, special attention was given subgrade compaction and stabilization. The subgrade was under surveillance from the very start of operations and, although lime rock was later to be introduced as a stabilizing agent, sections of especially unsuitable soil were removed and wasted.

### Subgrade Treatment

In both cut and fill areas, poor soil was stripped away and the area scarified. Along fill sections, the LeTourneau scrapers first removed unsuitable soil. The section was then scarified to a depth of 6 inches with a LeTourneau Rooter and a Caterpillar No. 12 motor grader. After scarification, the base of the fill was compacted with two types of rollers: first, a pneumatic-tire roller with nine low-pressure tires carrying a load of 8 tons; then, following it, a heavy-duty traffic-type roller or buggy with a wheel load of not less than 10,000 pounds. As the fill was built up from borrow in the airport area, compaction of the subgrade continued at optimum moisture in successive 4-inch lifts with the same two rollers.

In cuts, if the soil at the desired elevation was unsatisfactory, the area was stripped and the cut scarified to a depth of 6 inches. Compaction of subgrade in cuts was obtained with the same two types of rollers used on the fills. Specified density of compaction for the top 12 inches of subgrade in cuts was 97 per cent of the modified AASHO test.

Throughout all construction activities, compaction was particularly emphasized, extending even to fill over pipe, ducts, and basins. Tampers and rubber-tire rollers were used to compact this fill in 6-inch lifts to 95 per cent, with the upper lift compacted to 97 per cent.

One reason for insistence upon complete compaction on this job is the extremely heavy wheel load which the pavements—and the subgrades—will have to bear. Errett F. Gunn, Senior Engineer of the Savannah U. S. Engineer Office, pointed out that if subgrades are not thoroughly consolidated in construction, the traffic of heavy planes will consolidate the subgrades to a considerable depth with resultant detrimental settlement and unevenness.

### Lime Rock Stabilization

The U. S. Engineers considered possible methods of stabilizing the poor, sandy soil at MacDill Field. And they took notice of experiments with lime rock conducted by the Florida State Road Department. Along some unsurfaced stretches of unstable roads, the Road Department had distributed lime rock up and down the highway. Although no effort had been made to mix

the lime rock with the surface soil, it was noted that roads treated in this manner had much greater stability than untreated highways.

During the war, Army Engineers did some experimenting of their own with lime rock. At first, coarse lime rock was distributed along areas of unstable surface soil. But as the tests continued, the Engineers gradually used finer and finer material and also started mixing and compacting the lime rock. When used with sugar-sand, crushed lime rock showed a disposition to coat the particles of sand with which it was mixed and to fill the voids, providing subgrade material of good stability.

Using the California bearing ratio, U. S. Engineers determined that a subgrade of good stability could be obtained at MacDill Field by mixing the sugar-sand with 250 pounds of crushed lime rock per square yard.

A subcontract for lime-rock stabilization and base course was awarded by the contractor to L. J. & W. L. Cobb of

(Continued on next page)

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## Stabilized Subgrade, Hot-Mix for Runways

(Continued from preceding page)

Tampa. The Government furnished some 43,500 tons of crushed lime rock, graded from 1½ inches down to dust, from quarries belonging to the Florida Limerock Association and independent quarries in the Ocala area, about 75 miles north and east from Tampa.

Graded lime rock was unloaded from railroad cars by a Lorain 40 ¾-yard crane and hauled a mile to the field in six GMC 12-yard diesel-powered trucks and four 5-yard diesel trailer-type trucks. Lime rock was spread on the subgrade and windrowed by four Caterpillar No. 12 motor graders. The crushed lime rock was spread to a depth of 2½ inches and mixed by a Seaman Pulvi-Mixer. It was then spread by graders, watered, and compacted by sheepfoot rollers. At slightly above optimum, the subgrade was finally gone over with a Euclid loaded 10,000 pounds to the wheel. The subgrade was compacted to 100 per cent as determined by the modified AASHO test.

Stabilization of the subgrade did not end the use of lime rock. Another 8 inches of high-quality lime rock laid in two lifts of 4 inches each and rolled by 10-ton rollers comprised the base course for the bituminous-surfaced runways. Approximately 184,000 tons of crusher-run lime rock, graded 3½ inches down to dust, was furnished by the Government for the 8-inch base course.

Discussing the lime-rock stabilization at MacDill Field, Senior Engineer Gunn declared that the secret of successful stabilization with the material lies in not mixing it too deep. Mr. Gunn emphasized that on this project the 2½ inches of lime rock was mixed with only 3¾ inches of sand, making a total compacted depth of 6 inches.

The state and county road departments have watched the results of the lime-rock stabilization at MacDill Field with more than ordinary interest. Where similar unstable subsoils are encountered and where lime rock is available, a suitable foundation may be provided for almost any type of heavily traveled road. A base course of crushed lime rock on a stabilized subgrade will serve well as a secondary or farm-to-market road. With adequate surfacing, it will provide a heavy-traffic route.

### Bituminous Surfacing

Preparation of the subgrade, with the lower lifts compacted and the top lift stabilized with lime rock, was followed by an 8-inch base course of rolled lime rock. Involving 400,000 cubic yards of unclassified excavation and almost 230,000 tons of crushed lime rock, the dirt work done by the W. C. Shepherd Co., Inc., and the lime-rock stabilization and base course laid by L. J. and W. L. Cobb comprised the preliminary work for a new runway and a new taxiway.

The new runway is 7,000 feet long and 300 feet wide. The center 150 feet of the

runway is designed for 120,000-pound capacity operation. The 75-foot shoulders on either side are designed for limited operation at 120,000-pound loadings. The center 150 feet has a 3-inch bituminous surface, while the shoulders have just a bituminous seal coat over the lime-rock base course. The new taxiway, 4,500 feet long and

75 feet wide, is designed for 120,000-pound capacity operation and also has 3 inches of bituminous surfacing. In addition to the runway and taxiway paving, three runway intersections were reinforced by overlaying the existing concrete pavement with an 8-inch rolled lime-rock base and placing 3 inches of bituminous surfacing.

The original contract had included a considerable amount of bituminous overlaying on the concrete runways to provide more adequate facilities for the heavy B29's. To determine the type of overlay to be made on the concrete, U. S. Engineers ran an extensive series of tests on overlays varying from 3 to

(Continued on next page)



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## Stabilized Subgrade, Hot-Mix for Runways

(Continued from preceding page)

9 inches in depth on the existing 6-inch concrete slabs. A traffic buggy with a set of B29 wheels and tires was loaded with 60,000 pounds. It ran 3,000 coverages over a test track of various thicknesses of bituminous overlays. These tests are typical of the thorough and exhaustive approach to construction problems made by Army Engineers. When a project reaches the contract stage, nothing has been left to "guessimating".

Bituminous operations required 40,000 gallons of RT-2 tar prime; 750,000 gallons of asphalt and tar in the bituminous mix; and 87,800 gallons of RC-2 seal.

### Asphalt Plant

W. C. Shepherd Co., Inc., set up its asphalt plant on a railroad siding at the site of its field office, about 1 1/4 miles from the center of the job. Shepherd used a Barber-Greene 848 continuous-mixing plant with a 120-hp horizontal boiler. The double-drum Barber-Greene drier had a capacity of 100 tons per hour. A Buda gas engine was used with the drier and a Buda diesel engine with the asphalt plant. An enclosed hot-material bucket, about 15 feet high, was used and temperatures were registered with a pyrometer.

Bunker C low-grade fuel oil, heated by steam coil, was fed to the plant by a 3-hp rotary pump. Fuel oil was stored at the site in a 12,500-gallon tank and a 6,500-gallon tank. Five other 12,500-gallon tanks provided storage facilities for the asphalt.

Tar and asphalt were delivered in tank cars to the site from Arkansas, Florida, Georgia, and Tennessee, and heated by a Grace tank-car heater. Aggregate was Birmingham slag and Florida graded limestone, delivered in railroad cars and unloaded and stockpiled at night by a Lorain 40 3/4-yard crane. AC-8 85 to 100-penetration asphalt was used. Since all material was graded before delivery to the plant, there was no need for screens. The hot-mix from the asphalt plant was weighed on Fairbanks platform scales before delivery to the spreader.

The plant turned out an average of between 800 and 900 tons a day, with a "best" day of 928 tons of hot-mix, produced under supervision of Coley Besinger, Plant Foreman.

### Paving Operations

At the field, Buster Haskins directed preparation of base course and placing of the bituminous surfacing over the runway and taxiway. The 8-inch rolled lime-rock base course was swept clean with a Grace rotary broom, and the base was primed with a coat of RT-2. A Kinney 21-foot-bar distributor on a Mack truck was used for the prime coat.

J. W. Conner & Son of Tampa held a subcontract for hauling, and delivered between 85 and 90 tons of asphaltic-concrete per hour to the Barber-Greene spreader at the field. A 1 1/2-inch tar binder course was followed by a tack coat of AC-8, applied by the Kinney distributor. Then the 1 1/2-inch asphaltic-concrete surface course was laid with the same equipment as the binder.

Shepherd used three rollers in laying the runway and taxiway surfacing—a 5 to 7-ton Buffalo-Springfield, a 5 to 7-ton Galion, and a 10-ton Huber. The pavement was sealed with RC-2 and covered with 1,245 tons of stone screenings.

### Seeding and Sodding

Drifting sand and erosion at MacDill Field is controlled by extensive seeding and sodding on the field area. Shep-

herd subcontracted 200 acres of Bermuda sprigging and seeding and 1,000 square yards of solid-sod placement to Hill & Snell of Decatur, Ga.

Hill & Snell designed and built its own planter for use on the job. Pulled by an International TD6, the planter is a double-tier rig employing two or three workers on the upper platform feeding prepared Bermuda-grass sprigs to three or four workers on the lower platform. The planter digs a furrow, the worker inserts the sprig, a stream of water is injected, and a drag behind the rig covers the area. Hill & Snell planted over 6 acres a day with this planter. All sprigged areas were overseeded with Bermuda-grass seed at the rate of 10 pounds per acre.

The 1,000 square yards of solid sodding was placed along shoulders and slopes of drainage ditches to control erosion of the sugar-sand. Sod, 2 inches thick, was placed by hand along the top 12 inches of the slope and over 12 inches of the ditch shoulder. A total of 170 acres of seeding and planting was

fertilized, about 140 acres with high-grade fertilizer, and approximately 30 acres with high-nitrogen-content sewage sludge.

### Equipment Maintenance

All equipment used by the W. C. Shepherd Co., Inc., on the MacDill Field project was serviced and maintained at a large and completely equipped repair shop set up near the field office. Trucks,

tractors, and shovels were serviced and lubricated at least once every 10-hour shift. All repairs were handled at the shop. Repair equipment included a Rodgers track press, forge, hydraulic jack, buffers, drills, lathes, a refacer, arc welder, and battery charger.

### Personnel

On an average, 240 men were em-  
(Concluded on next page, Col. 2)

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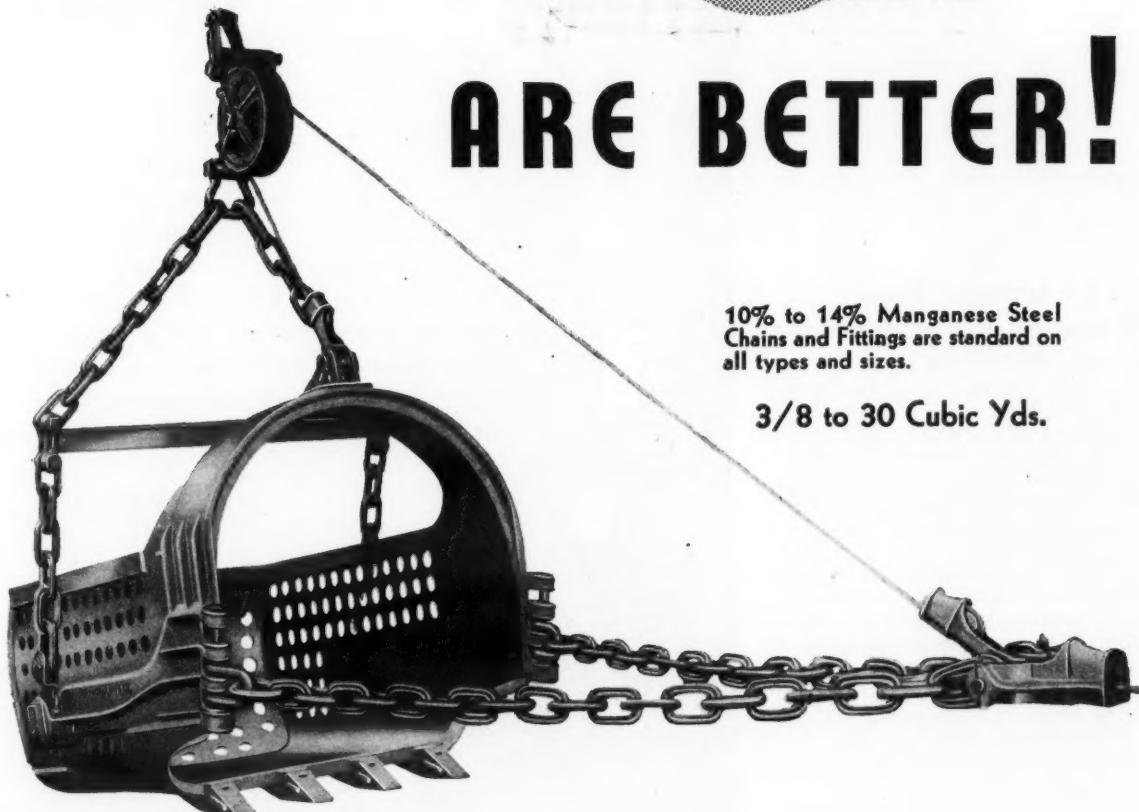
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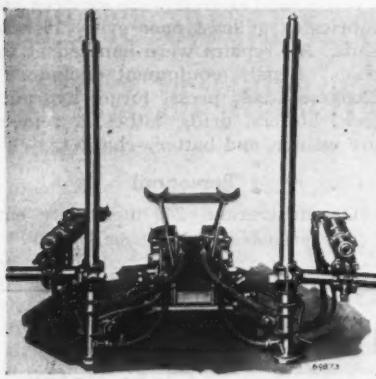
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Ingersoll-Rand's new air-operated jumbo for drill mounting is designed for easy drilling and fast set-ups.

### Drill-Jumbo Mounting For Tunneling Work

A new air-operated drill-jumbo mounting recently announced by Ingersoll-Rand Co. is designed for easier, safer work, and faster set-ups.

Installed permanently on a tunnel car, the mobile DJM aims to reduce setting-up time. The rig not only does the setting up; it also transports the drifters, drill steel, hose, and accessories to the heading, relieving the men of this burden.

When the unit has arrived at the heading, the crew merely swings the air columns of the mounting into a vertical position. The footpiece hinges make full use of gravity to aid this operation. When the air is turned on, the column pistons are pushed firmly against the roof. No blocking is needed and the drills are ready to operate.

The firm says that little effort is required to move the arms and the drifters up or down the column with the hand cranks provided. The entire unit is rigid, due to a 600-pound force holding the column and the car in place, I-R also says. The car can be made at the tunnel to suit specific conditions.

That this new mounting can speed your work, give you fast drill service, and make things easy and safe for your tunnel crews is claimed by Form 4034. It is available to readers of CONTRACTORS AND ENGINEERS MONTHLY. Write Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y., for copies.

### Shift to Larger Size Extends Rope Service

An official of the Isbell Construction Co., Reno, Nev., has advanced an argument for larger grooves in the sheaves and drums of heavy equipment using wire rope. On the basis of a recent test, the firm contends that regrooving sheaves to accommodate a slightly larger wire rope will lengthen the service life of the rope.

The firm operated two 2½-yard power shovels, side by side and under identical conditions, in order to test its belief. The only difference between the two outfits was that one shovel was equipped with 1-inch-diameter rope, while the other, its sheaves regrooved, used 1½-inch rope. The rope in each was 6 x 19 preformed regular lay, of improved plow steel.

The service records for one run showed that the larger rope moved a total of 257,967 tons of material, while the 1-inch rope turned in a volume of only 112,184 tons. Isbell is now regrooving all its sheaves and drums, as it becomes necessary, to accommodate a slightly larger wire rope. It expects to double the rope's service at a very slight increase in cost.

The size of rope and the size of sheave and drum diameters today are governed by standards created many years ago, before the advent of flexible preformed wire rope. Isbell's experience would seem to indicate that such standards may have become obsolete and may bear revision.

### Stabilized Subgrade, Hot-Mix for Runways

(Continued from preceding page)

ployed during construction operations at MacDill Field, working a 10-hour shift 6 days a week. In addition to the subcontracts mentioned, W. D. Owens of Clearwater, Fla., constructed storm sewers and drainage structures; Bigby Electric Co. of Tampa installed ducts and electrical work; Townsco Contracting Co. of Oklahoma City did the painting; and Southern Builders of Tampa held the subcontract for buildings.

Colonel Paschal N. Strong is District Engineer of the United States Engineer Office at Savannah, Ga., which was in charge of the MacDill Field project. Erret F. Gunn is Senior Engineer at Savannah, while Arthur E. Winn is in charge of all military construction in the District. The Project Engineer at MacDill Field was J. O. Bacon, and R. B. Sanders was Resident Engineer. J. B. Campbell was Assistant Project Engi-

neer and C. B. Kneller was in charge of drainage work.

The W. C. Shepherd Co., Inc., was represented at MacDill Field by Clyde Shepherd, Jr.

### A Correction

The article on page 4 of our August issue discussing Federal Aid for Class IV or larger airports was in error in

stating that such aid is available in the current fiscal year. Although legislation making it available now was passed by the House, it was not voted on by the Senate during the 79th Congress. There is still a possibility, however, that Federal grants for large airports may be made during the current fiscal year if the necessary legislation is introduced and acted upon favorably immediately by the 80th Congress.

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# Engineers Study Source of Floods

**U.S.E.D. Weather Bureau Scientists Probe Flood Secrets in Heavy Snows On Mountain Peak**

WHAT month, what week, what day will a flood occur? California engineers would like to have the answer to that question. So they have enlisted the aid of science in a 7-year research program. They are exploring stream flow at its source. They are braving zero weather, 20-foot snowdrifts, and elevations up to 9,000 feet, in an effort to probe the fundamental cause of floodwater—precipitation.

High on Donner Summit in the Sierra Nevadas, the ill-fated Donner emigrant party froze to death in the winter of 1846-7. It is there that the U. S. Engineer Department and the U. S. Weather Bureau have jointly established the Central Sierra Snow Investigation Laboratory. The scientists are trying to find some kind of reliable conversion factor between weather and river stages.

Some day soon they hope to be able to predict, from basic weather data and a few simple snow measurements, how much water will flow down any Sierra stream, how fast it will come, and when. What they are searching for is a conversion factor previously unknown to mankind; like the atomic scientists, they have now ventured out into a scientific no-man's-land beyond the solid foun-



U. S. E. D. Photo  
Here is Donner Summit, 7,200 feet high, site of a U. S. E. D.-U. S. Weather Bureau survey. Note how swirling winds at the summit are moving the snow. The dark line is a timber shed over the Southern Pacific tracks so that trains can proceed under the drifts.

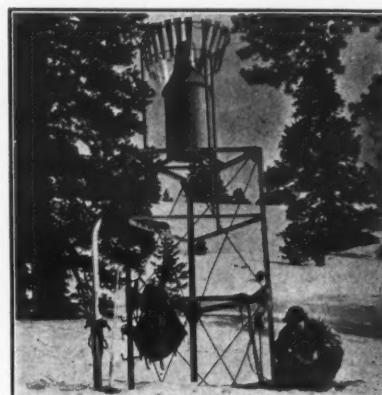
dation of present-day knowledge on the subject.

Realizing the tremendous value of

this knowledge to their departments, the U. S. Bureau of Reclamation and the U. S. Forest Service have taken up the cue. They will assign some of their top hydraulic engineers and weather experts to the snow laboratory next winter. Just how significant the Sierra snow fields are to flood control, irrigation, soil conservation, and erosion, can best be illustrated by quoting Merrill Bernard, head of the U. S. Weather Bureau's Hydrology Section.

"Snow fields in the mountainous west are to be considered vast reservoirs just as truly as man-made dams," he said. And what reservoirs! Reservoirs which will move if a few hours of sunshine strikes them—reservoirs which become unstable to some degree under the movement of different types of air masses.

The Fourier equation is a classroom theory in physics that has to do with the diffusion of heat through a non-uniform mass. It has been in vogue for 50 years. But the same scientists who studied it in universities now have a puzzled look



U. S. E. D. Photo  
An important instrument in the snow survey is this snow storage tank. A solution in the tank melts falling snow, making it possible to measure snowfall in terms of precipitation.

on their faces after last winter's session at Donner Summit. Theirs is the problem of proving or disproving this the-  
(Continued on next page)



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Aquella, having proved its effectiveness on cinder concrete blocks, under conditions as extreme as this, must necessarily be equally successful when applied to other types of masonry construction such as concrete, brick, stucco or cement plaster.

**AQUELLA IS A "MUST" on every light-weight concrete masonry unit job!**



U. S. E. D. Photo

This pyrheliometer, prima donna of the snow-survey instruments, is so delicate that even a shadow affects it. From it is learned the amount of heat, in calories, absorbed by snow. It takes 80 calories of heat to melt one gram of ice or snow at 32 degrees F.

## U.S. Engineers Study The Source of Floods

(Continued from preceding page)

oretical equation.

State snow surveys were a valuable forerunner of this experiment. They will be a welcome supplement in years to come as they measure the volume of snow and the amount of water in it. What the current research is trying to find out is how much of that snow water actually comes down hill, when, and how fast.

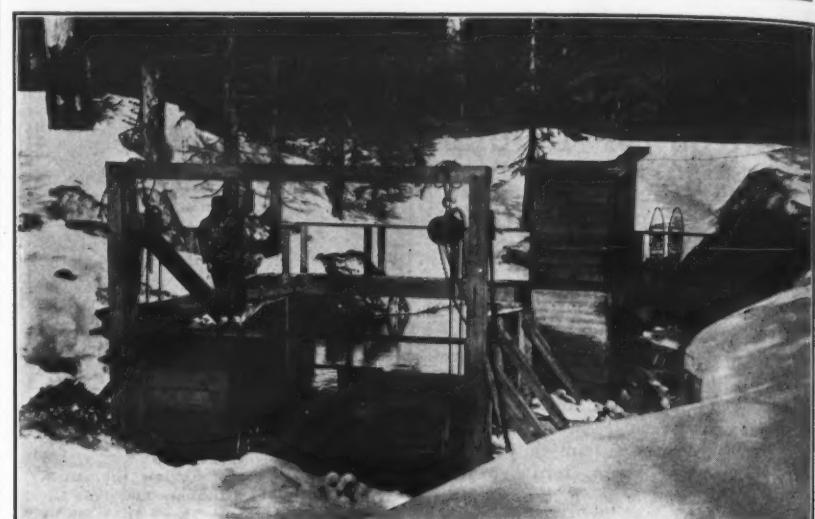
The research work is being carried on throughout a 4 1/2-square-mile area of snow and ice in Castle Creek Basin, high on the western Sierra slopes. Temperatures go below zero, and winds hit a velocity of 100 miles an hour there. The researchers used skis and snowshoes to get around locally, but instruments were hauled great distances by an Allis-Chalmers snow tractor made for Army arctic campaigns. Powered by a Willys engine, this machine enabled the scientists to travel farther in an hour than state researchers used to go in a day. The polar "snowmobile" was driven something like an automobile. However it had skis in front when the ground was covered with

snow, and this was most of the time—about 20 feet of it!

### The Instruments Used

The snow laboratory may or may not have been over-instrumented last winter. But the chances are that if any change is contemplated during the next six winters, it will be in the direction of even more precision instruments. The men used everything from mercurial barometers to vacuum bottles. One ultra-sensitive instrument, the pyrheliometer, picked up the amount of solar radiation in terms of calories, measured the amount reflected from the snow, and gave the scientists this vital information by one simple subtraction. Even the shadow from a cloud will affect this delicate instrument.

The first winter nearly twice the average 37 feet of snow fell near the laboratory. It packed to 18 feet generally. It was sampled at various depths, and calibrated under various conditions to see how much sampled snow would change a known amount of



U. S. E. D. Photo

At this weir in Castle Creek, high in the Sierra Nevadas, snow run-off is measured.

water in degrees of temperature. Samples of snow were carefully weighed,

for weight is a direct index to its water (Concluded on next page)



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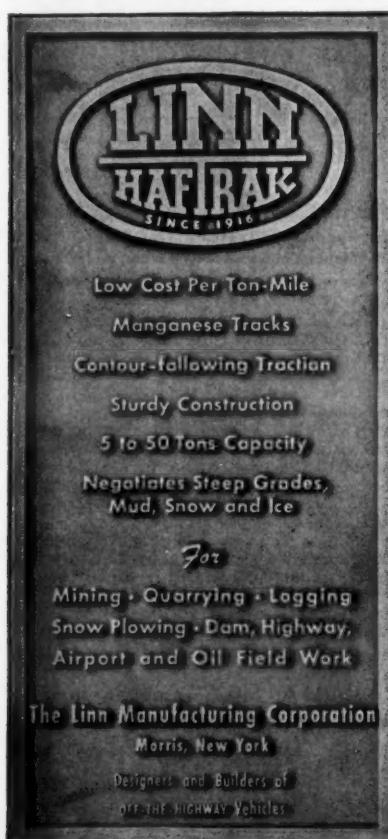
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U. S. E. D. Photo

Meteorologist Bill Enloe checks one of the outside stations. The box has a wind-speed recorder, maximum and minimum thermometers, and a hydro-thermograph to record temperature and humidity. Ink in the recording instrument contains anti-freeze.

## U.S. Engineers Study The Source of Floods

(Continued from preceding page)

content. Snowfall was measured in terms of inches of precipitation.

Wind velocities were recorded. A hydrothermograph jotted down temperature and humidity. Duration of sunshine was noted each day, and there were many days when Donner Summit was shrouded in swirling snow. A microbarograph was used to make a continuous record of air pressure. Micromax recorders in the laboratory shack automatically jotted down temperatures of soil, snow, and air from 28 outside points within a quarter of a degree F, at one-minute intervals. A weir was made in Castle Creek to measure actual run-off from the area studied. Three shafts were sunk to get the dope on ground water trying to sneak underground unnoticed.

### Personnel

These are a few of the things the scientists did the first winter. Already they have found information no one—even famous Dr. J. E. Church of Reno, "Father of Snow Surveys"—ever knew before. During the summer months they correlated, as best they could at this

stage, the data they gathered.

Dr. Robert W. Gerdel, physicist, is the head of the snow laboratory. Others who braved snow, zero temperatures, and frostbite were: Ashton R. Codd, hydraulic engineer; Parley Merrill, engineering aide; and Bill Enloe, meteorologist. Colonel Lester F. Rhodes is the District Engineer for the Sacramento Office of the U. S. Engineers.

Flood-control dams and channels are expensive precision-built structures. The information these scientists seek is not theoretical; it is as practical as a cure for cancer. When they have found it, and turned the information over to the designers of dams and irrigation systems, they will have made a contribution of incalculable value to western engineering.

### Ceco Sales Staff Changes

New Managers for its Oklahoma City and Dallas sales districts have been announced by the Ceco Steel Products Corp., Chicago. John W. Anderson,



U. S. E. D. Photo

Dr. Robert W. Gerdel, Director of the snow laboratory, checks an instrument which registers wind velocity, wind direction, and duration of sunshine at outside stations at one-minute intervals.

until recently Assistant Manager at Birmingham, Ala., succeeds R. K. Alex-

ander in Oklahoma City. The Dallas post, formerly held by J. C. Boyce, is now held by George Hajek, a Ceco sales engineer for 12 years.

Mr. Alexander, Anderson's predecessor at Oklahoma City, is now in charge of Ceco's sales office and warehouse in Houston.

### Roadside Mowing

Weeds and grass along the roadside and on the airport can be mowed with a Case VAI tractor fitted with the Case-Detroit No. 14 mower. The VAI, a 4-cylinder gasoline-driven industrial model, has the No. 14 mounted ahead of its rear wheels. The mower's cutter blade has a mechanical lift and automatic relocking break-back.

Highway maintenance engineers and airport managers can secure further details on these complementary units from literature issued by the J. I. Case Co., Racine, Wis. Mention this notice and ask for Form A-14146-C on the tractor, and Form A-11846-A on the mower.



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To understand why the Chevrolet engine is extra-efficient, see the adjoining text. Or, you may just decide that valve-in-head engines *must* develop the most power . . . why else would they be used in cars, planes and boats that are built expressly to set new performance records?

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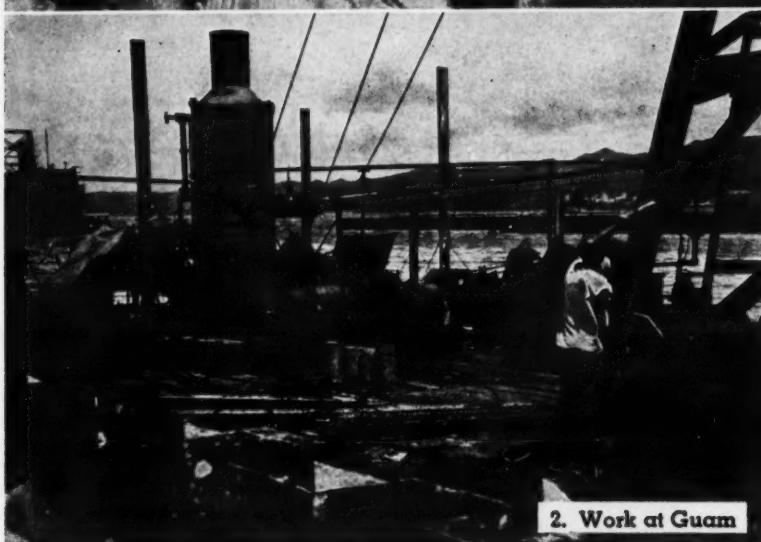
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# The Seabees Where Are They Now?



1. Trinidad



2. Work at Guam



3. Hunt in the Pacific



4. Return to Civilian Life

A year has passed since V-J Day. What has happened to the famous Seabees in that year? Are the men for whom nothing was impossible in wartime able to make a living now? How are they doing? Are they neurotic wrecks? Are they a problem to Selective Service Boards? Or have they put the famous improvising skills displayed overseas to peacetime use in whipping up jobs?

In the belief that answers to these questions would be interesting, our Western Field Editor, Ray Day, interviewed a former Seabee, Frank Hunt, whom he had known during the war years and whose progress he has watched with interest.

Hunt is a well known Los Angeles foundation contractor. He has a file of Navy commendations to his credit. But Hunt knows that in civilian life such commendations mean precisely nothing. Mixed with Hunt's pride in wartime jobs well done are bitter memories of Navy caste, of waste and inefficiency, of favoritism and brass hats. While Hunt would do it all over again under similar circumstances, as would most former Seabees, he is happier than words can tell to be a civilian again. To which Day, also a former Seabee, adds his own hearty "Amen!"

How well the Seabee spirit hurdled reconversion for typical Seabee Hunt is told in these pictures.

1. Hunt brought a wealth of pile-driving and foundation technique to the Seabees. In Trinidad, Hunt's battalion had to finish building and operate a Naval base. Hunt got himself assigned to dock work, in charge of driving 1,148 concrete piles 16 to 18 inches square. Water was 30 to 55 feet deep over the coral bottom. Tricky 4-knot tides lashed at the dock. Before he could get going, Hunt had to finish a floating pile driver started by the civilian contractor. A CCM at the time, Hunt pushed the job through ahead of schedule, without hurting a man. Public Works Officer S. P. Zola, recognizing meritorious work, initiated Hunt's first commendation leading to the warrant officer's cap he wears.

2. They started from scratch at Guam. No real harbor existed there. This island's Apra Harbor, planned for a gigantic staging base, required nearly 3 miles of docks and wharf frontage. An urgent message crackled through the airwaves. The magic fingers of Kardex sifted through hundreds of officers' personnel cards. Insurance and shoe clerks were discarded. Construction men were wanted. Warrant Officer Hunt, among others, was located and flown to Guam. The 3-mile job was bunched up in a space of 100 yards. He was assigned as "helper" to the officer who had bunched it.

Driving equipment consisted of land-based cranes. Hunt's first job was to get the idea of a floating pile driver across to his seniors . . . then to build it. It is shown here in the process of construction.

3. Hunt's tactful persuasion soon had the job strung out a half mile as it should have been. Dock work began to crowd the dredges. High-ranking officers in the battalion began to take notice. The job was done. Then the end of the war brought welcome relief to this typical construction man who by now had been promoted to chief warrant officer.

4. Back in the USA and a civilian again, Hunt inspects his rotary drilling rigs. The same machines put foundations under the Beverly Hills City Hall, Post Office Building, Fire Department, and the I. Magnin store. They did some of the work at the Ford plant. Mrs. Hunt kept them busy during her husband's absence in the Pacific. Although they were worn, Hunt figured the job of repairing them would be merely a matter of parts.

The operating principle of these drills is simple. They bore a round hole into the soil; the hole is filled with reinforcing steel and concrete. That's all there is to it. Calculations and load tests made in the past have accurately established skin-friction values for nearly all soil conditions around Los Angeles. These range from 260 to 700 pounds per square foot. Design load divided by this friction value gives pile length. Most are under 40 feet, though Hunt has sunk holes as deep as 150 feet.

Formerly a Superintendent for Raymond Concrete Pile Co., Hunt competes on friendly terms with his former employer. Now he has landed a big contract for drilling 90,000 linear feet of intermediate foundation holes under the new General Motors assembly plant at Van Nuys, Calif.

5. "How's it going, boys?" is Hunt's stock greeting, as several times a week he puts on old clothes and goes out to look over the jobs. Labor, the contractor's No. 1 problem, has its moments with Hunt, too. On a whole, he is a good employer. He is intensely practical. He knows what he wants. He picks the best men he can find,

gives them what they need to drill, and gets The same unpretentious attitude in Seabee service glad to work for him.

6. Foundation overburden under a General plant is clay-loam high in skin-friction value. Rigs drill three 30-foot foundations in hours a day for their owner. Frequently, Hunt holes or makes core samples for proved work a tip-off for future business. His is a service because it fills a need. And Hunt enjoys in the game where competition is a matter of stead of rank.

7. These piles are now finished, filled holes background are sealed with plant grout to out before concrete and steel are used. Contract calls for drilling only; core is being by the prime contractor, Wm. Simpson Construction.

8. Hunt says that one of the first things return to civilian status is his car. With in his pocket, he knows his car where to can go when and where he chooses. days of transportation officers, red tape and a library over.

9. What does the Selective Service Board think Seabee veterans it is designed to be? "They don't need help," says H. H. McGookin, head of Service Board 181. "There may be a Seabee come out of the service and failed to get a don't know of a single instance. Most of them glad to get out of the service they were work on civilian construction projects. McGookin revealed that routine calls for help to veterans were ignored by Seabees and A-neers, or returned with the words 'don't help'. All of which indicates that the Seabees doing badly at reconversion.

Hunt is all in favor of the Seabees' Re-enlistment. It is used as a clearing house for technical advancement. Hunt believes it will be good for the engineering-construction profession. But if by officers to bolster their ranks, its purpose will be destroyed.

And if the whole thing were to ever again Seabees would do it.



8. A Car Owner Again



lian Life

need to drill, and gets production. His attitude makes Seabees in the area want to work for him.

General Motors is a good customer under Hunt's hands. Hunt's value. Hunt's foundations in hours; gross \$100. Frequently, when Hunt drills test samples for paved work, he gets business. His is a service that sells.

And Hunt is happy to be back in competition is a matter of merit in-

now finished. Dug holes in the ground with planks to keep dirt and steel on road. Hunt's GM only; concrete being handled by Wm. Simpson Construction Co.

one of the nice things about the is his automobile. With his keys in his pocket, his car will wait for him. He chooses days of requests, red tape, and a liberty pass

Selective Service board think of the designed to be? "They simply H. H. McCord, head of Selective Service. There may be Seabee who has been rejected and failed to get a job, but I instance. Most of them were so service that they went back to construction work within a week."

at routine check on government ignored by Seabees and Army Engineers. In the words, "don't need your indicates that the Seabees aren't

of the Seabees' Reserve. If

house for technical information and

believes it will be good thing for

profession. But if it is used

their wimpy by re-living

will be destroyed.

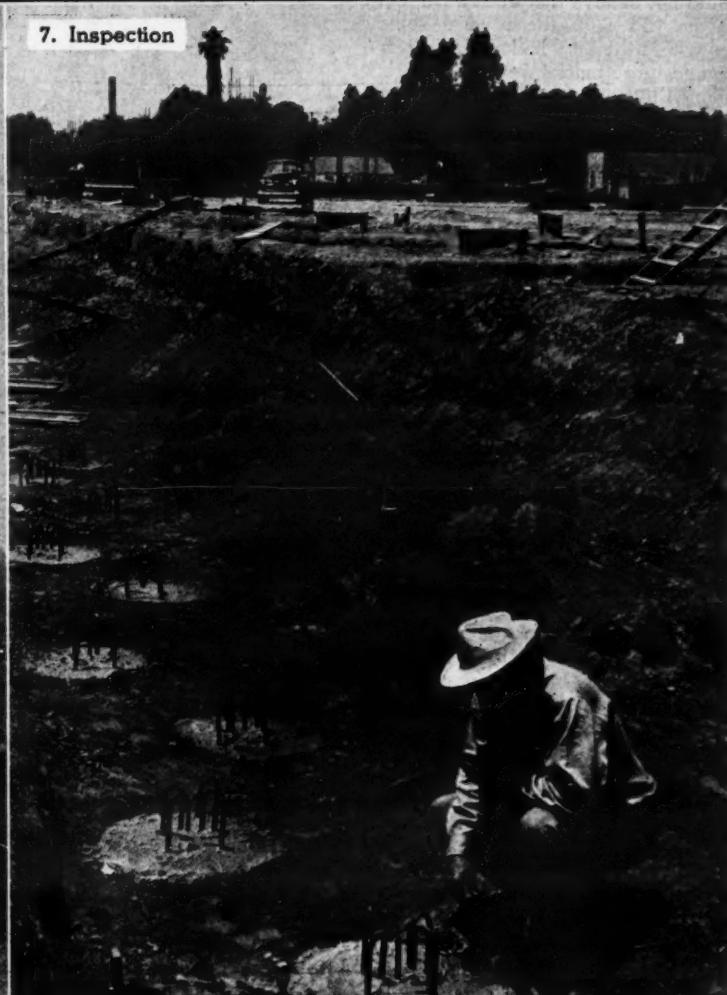
ing were to cover again, most



5. Out on the Job



6. Hunt's Drill Rig



7. Inspection



9. No Ex-Seabees Here

# New Highway

(Continued from page 1)

necessary to keep a water tank on the job during burning operations as a precautionary fire-prevention measure.

Clearing generally started at the low side of the right-of-way and proceeded towards the upper side. This was the most efficient way to handle it, for as trees fell, they could be rolled down to the burning location on the low side. Moreover, bulldozers could then start pioneer work on several cuts in the clear so far as brush was concerned.

#### Excavation

Three Caterpillar D8 tractors, each carrying a LeTourneau bulldozer blade, were used in the first pioneering. They worked their way to the top of mountain grades so steep that later, when the writer visited the job and saw their tracks outside the slope lines high above, he could not believe that even a D8 had hung on. In fact, there were some places where the D8's had slid 2 feet or more, and those marks were still there, undimmed by rain, for all to see.

It is difficult to classify the excavation material, for in some distant geologic age this part of Oregon heaved up out of the sea. Earth, sandstone, serpentine rock, and limestone were broken up and mixed together. There is some granite, particularly in the boulders of creek beds near by. In some places tough ledges of fairly hard rock were found. Over it all a thin blanket of red clay sealed from view the turbulent formation.

Backslopes for all cut sections were specified to be 1 to 1. The Caterpillar began working down to these rough slope lines, and just as soon as possible one of two Caterpillar No. 12 motor graders was brought in to do all slope dressing by mechanical means. No labor was used on the slopes, except that of surveyors and a grade boss who checked slopes with a hand level.

When the tractors opened the cuts sufficiently to let material be hauled, five LeTourneau 15-cubic-yard FP Carryalls were introduced, each pulled by a D8. The cuts were all so equally spaced and so steep that all loading was done downhill, sometimes on grades up to 40 per cent. Earth was hauled to the bottom of the nearest fill and dumped. At the start of filling, it sometimes had to be spread by a bulldozer before it could be rolled by one of two sheepfoot rollers on the job.

Later on during the job, as cuts grew deep and fills came up to the engineer's grade marks, hauling conditions got better. Superintendent Stanley Quigley then used three Super C LeTourneau Tournapulls and three Tournatrailers. He loaded the Tournapulls with the help of a pusher tractor, usually a D8 with a ripper which it used between loads.

#### Drainage

One of the toughest problems was that of cutting drain trenches and laying drain pipe in the bottom of canyons

deep underneath the location of fills. Rainfall in Oregon is heavy each year, and long after the rain run-off, seep water will eat at the toe of any fill placed across it.

At times, up to 20,000 cubic yards had to be dug out and stockpiled. Then the perforated pipe and gravel drains had to be placed, and the earth backfilled around the drains. Some of the places

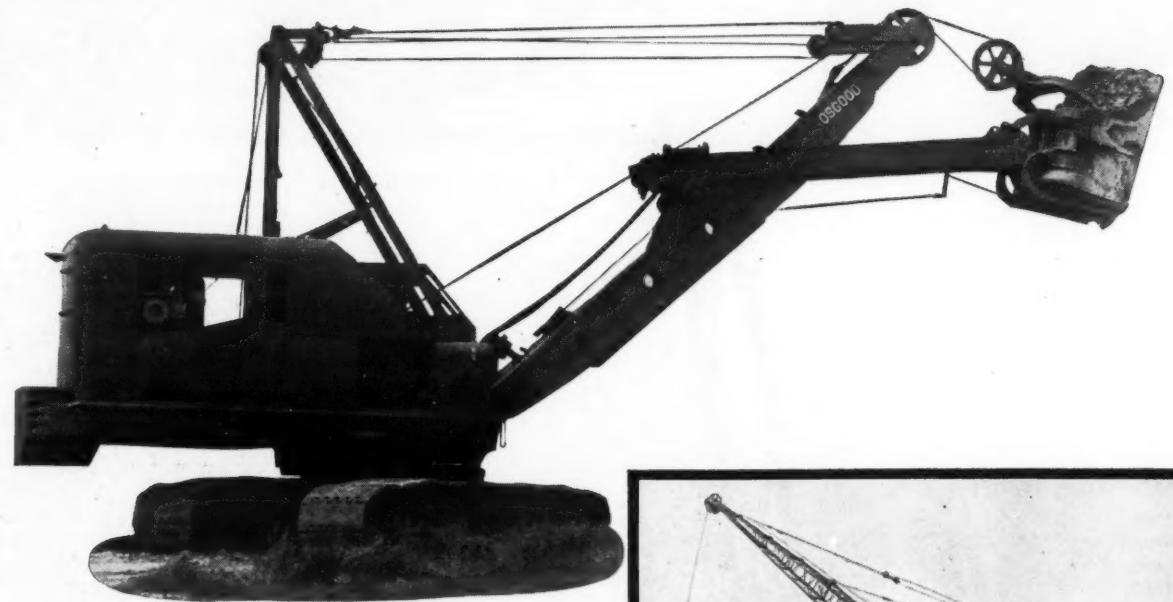
were so inaccessible that it was impossible even to use a dragline. The drains were gouged out by bulldozers, dressed by hand labor, and eventually finished to neat lines. Perforated pipes under all the big fills will now take care of the water run-off problem, but getting them in there was a job Superintendent Quigley and his men will remember for a long time to come.

**Handling Rock**  
As excavation went deeper, the formation became so hard that two LeTourneau Rooters were used behind D8 Caterpillar tractors. These Rooters, each using two teeth, worked their way down through the broken formation with comparative ease. Only 40,000 cubic yards could not be handled in

(Continued on next page)

# Built FOR THE Big JOBS!

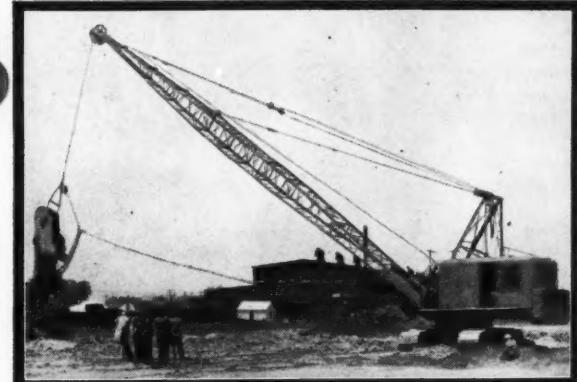
## The OSGOOD Type 100



### SHOVEL • DRAGLINE • CLAMSHELL • CRANE

From crawler treads to point sheaves, the new OSGOOD Type 100 is designed and built to handle the big jobs. As shovel, dragline, clamshell or crane, the Type 100 will wade right into the toughest work you have and turn in a profit-making performance. Powerful and sturdy, the Type 100 is completely air-controlled, providing an ease of operation that means just as much production in the last hour of the day as in the first.

Air booster brakes and air-controlled steering contribute to the smooth performance of the Type 100. A conveniently arranged bank of hand levers and foot pedals control every operation of this new machine. Positive air control enables the operator to get the "feel" of this powerful unit instantly. Self-clean-



ing treads, oversize point sheaves, a new quiet-operating swivel-type fairlead and a host of other features of interest to every construction, excavating and material handling engineer are completely described in the new Type 100 bulletin. Get your copy now!



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AND SHOVELS  
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**DON'T SKIMP!**

## New Highway

(Continued from preceding page)

this method and had to be shot.

Three Schramm compressors—a 315-cfm, a 240-cfm, and a 105-cfm machine—were brought in with six Gardner-Denver and Cochise jackhammers. Timken steel and detachable rock bits were used.

The mountains through which the new highway will pass are so unstable that the Oregon State Highway Commission in its specifications limited the explosive shock of shooting by specifying that no holes deeper than 20 feet could be drilled. The reason for this provision was sound: extensive explosions would have stirred up slides and probably aggravated maintenance problems after the road was finished.

Holes under 20 feet were therefore drilled by the jackhammers on random centers, depending on the hardness of the formation but generally about 6 feet. Bits 1½ inches in diameter were used for a distance of from 1 to 8 feet before they dulled. Dull bits were sent to Portland to be sharpened, and after about three resharpenings they were discarded.

All blasting was done late in the 1945 working season, and the rock was loaded out later by a Northwest 80-D shovel, which had already seen some active service on the job loading hard formations and excavating for one or two drain structures.

### Care of Equipment

Equipment has been subjected to a terrific beating, both from grades encountered, dust, mud, and tough loading. During the winter season when the job was pretty well tied up and nothing could be done, many of the tractors were overhauled in the 50 x 50-foot shop McNutt Brothers maintains on the job. The work was done by key men whom Quigley wished to retain for the 1946 construction season.

Steep grades had played hell with brake bands, and many brake jobs were done. Another important mechanical adjustment was the installation of heavier-duty oil filters to prolong the life of lubricating oil. The Caterpillar D8's were outfitted with Winslow Free-Flo oil conditioners, and the man who runs the traveling Alemite unit says



C. & E. M. Photo

Resident Engineer G. E. Roberts, Superintendent Stanley Quigley, and Grade Foreman Art Guntly pause for a moment on the McNutt Brothers contract.

that crankcase oil now lasts 120 operating hours instead of the 60-hour aver-

age before they were installed.

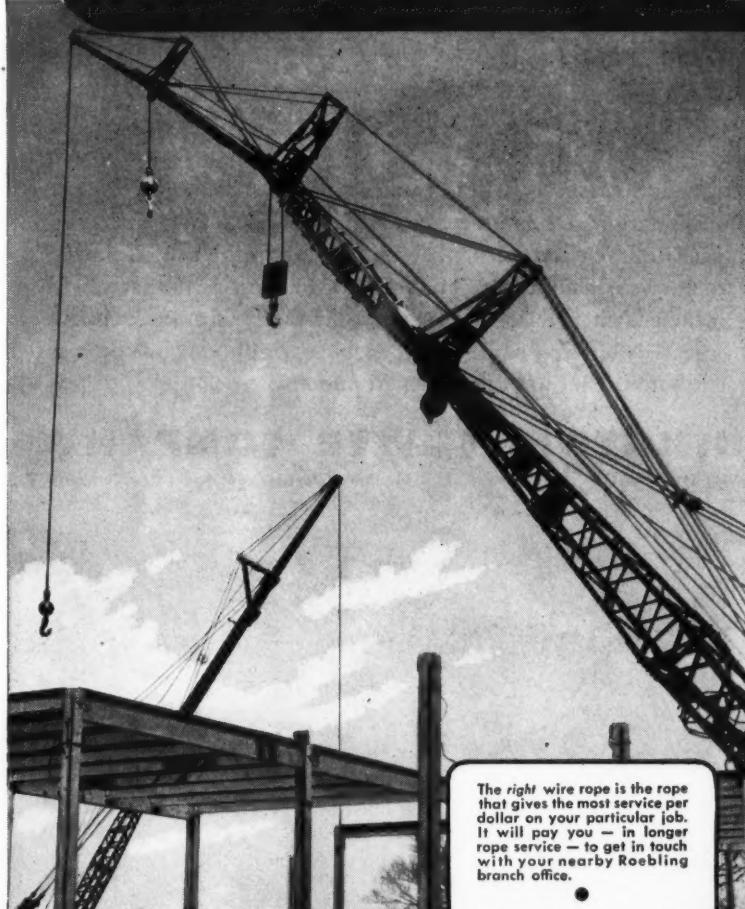
Excavation operations on a 16-hour basis ended at 12:30 a.m. The machines were serviced by a traveling Alemite-fuel truck which left the yard at noon and serviced after the morning shift ended about 2:00 p.m. The grease monkeys worked a split shift; they went home and returned later to be on hand at midnight, when the tractors came in off the line, to give them a second checking over for the day. A modern shop on the job handles all but the heaviest repair, with a force of three mechanics. Trucks from the rock-crushing plant also were repaired there.

Small spare parts were kept in compartments in a house trailer located in the equipment yard, and the job office was also located there.

At the time the project was visited, rock was being crushed and stockpiled for later use in road-mixing the road surface, but this work had not begun. According to Superintendent Quigley at that time, completion of the

(Concluded on next page, Col. 4)

## HOW TO CHOOSE THE *RIGHT* ROPE



The right wire rope is the rope that gives the most service per dollar on your particular job. It will pay you—in longer rope service—to get in touch with your nearby Roebling branch office.

Testing a length of Roebling "Blue Center" Steel Wire Rope is important—to you. It gives engineering data to your Roebling Field Engineer...information that can save your wire rope dollars.



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## CUMMER ASPHALT PLANTS

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30 to 100 Tons per hour

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50 Years' Experience

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... and get lowest handling cost!

YOU DON'T ALWAYS have the time to study the often obscure details affecting wire rope service on your installations. But your Roebling Field Engineer is constantly making such studies.

His daily contacts include tracking down the facts on practically every type of wire rope installation. He has specialized knowledge of wire rope usage ... and of wire rope, too.

After careful study the Roebling Field Engineer can help you choose the right rope ... the one that will give you top service per dollar. Of course, he will recommend Roebling "Blue Center" Steel Wire Rope. For here is a complete line—both preformed and non-preformed—where he can find the wire rope that combines the right balance of strength and flexibility, of fatigue and abrasion resistance.

Call or write our nearest branch office. Get in touch with your Roebling Field Engineer.

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## Air-Entraining Study Is Issued by the HRB

The pamphlet series issued by the Highway Research Board during the war, under the general heading "War-time Road Problems", met with such response that the Board has decided to continue it under the title "Current Road Problems".

Many phases of current highway technology are still in the development stage. Common practice has not been established even in dealing with some day-to-day problems of construction. In order to assemble the best current knowledge about these problems, and to recommend the best procedures, the Board plans to issue bulletins on various subjects in the "Current Road Problems" series.

It has recently issued Report No. 13 on the use of air-entraining concrete in pavements and bridges. Running 35 pages, the study discusses air-entraining cements and admixtures, giving advice on the best usage and practices. It

also includes, in appendices, ASTM standards for air-entraining portland cement, ASTM tests for the air content of portland-cement mortar, instructions for making a caustic soda solution of Vinsol resin, details on the use of Drex AEA, and a suggested procedure for evaluating admixtures for entraining air in concrete.

Copies of "Current Road Problems" No. 13 can be obtained from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C.

## Sturdy Construction In Hydraulic Jacks

Applicable to many lifting tasks, a new series of all-purpose hydraulic jacks has been announced by the Duff-Norton Mfg. Co. Known as the Hy-Power jacks, the line has eight models in capacities ranging from 3 to 50 tons. They can be equipped with gages to indicate the weight being lifted.

Precision manufacture and machine

cutting of many parts feature the jacks, Duff-Norton explains. One-piece bases, for 12-ton sizes or smaller, are formed from ribbed malleable iron with integral pump barrels. Large sizes have alloy-steel bases with armor-plate steel guards on the pump barrels.

Oil is sealed inside the jack in tanks, so the unit can be used both vertically and horizontally. Filter screens protect the oil lines from dirt. Rams and cylinders are made of high-carbon seamless steel tubing. The smaller models have extension screws which can be run up by hand to load height. A safety bypass prevents the ram from being pumped beyond the safe limit of raise.

Duff-Norton will be glad to supply our readers with full details. Write the firm at Box 1889, Pittsburgh 30, Pa.

## Heads Scale-Firm Outlet

J. G. McCarty has succeeded H. J. Steidley as Manager of the Pittsburgh branch of the Howe Scale Co., Rutland, Vt.

## New Highway

(Continued from preceding page)

grades would see the greatest problem whipped, though this does not in any way lessen the important job "Buck" Schaefer and his rock-crusher helpers have been doing on rock processing.

### Personnel

Schaefer and Quigley are Job Superintendents, G. E. Roberts is Resident Engineer, and Art Guntly and William Ridle were the Foremen in charge of grades and excavation. R. H. Baldock is the State Highway Engineer for the Oregon State Highway Commission, and H. G. Smith of Salem is Chief Engineer in charge of construction.

**Does the job of 5 ordinary mowers . . .**

## THE WORTHINGTON "HIGHWAY RANGER"

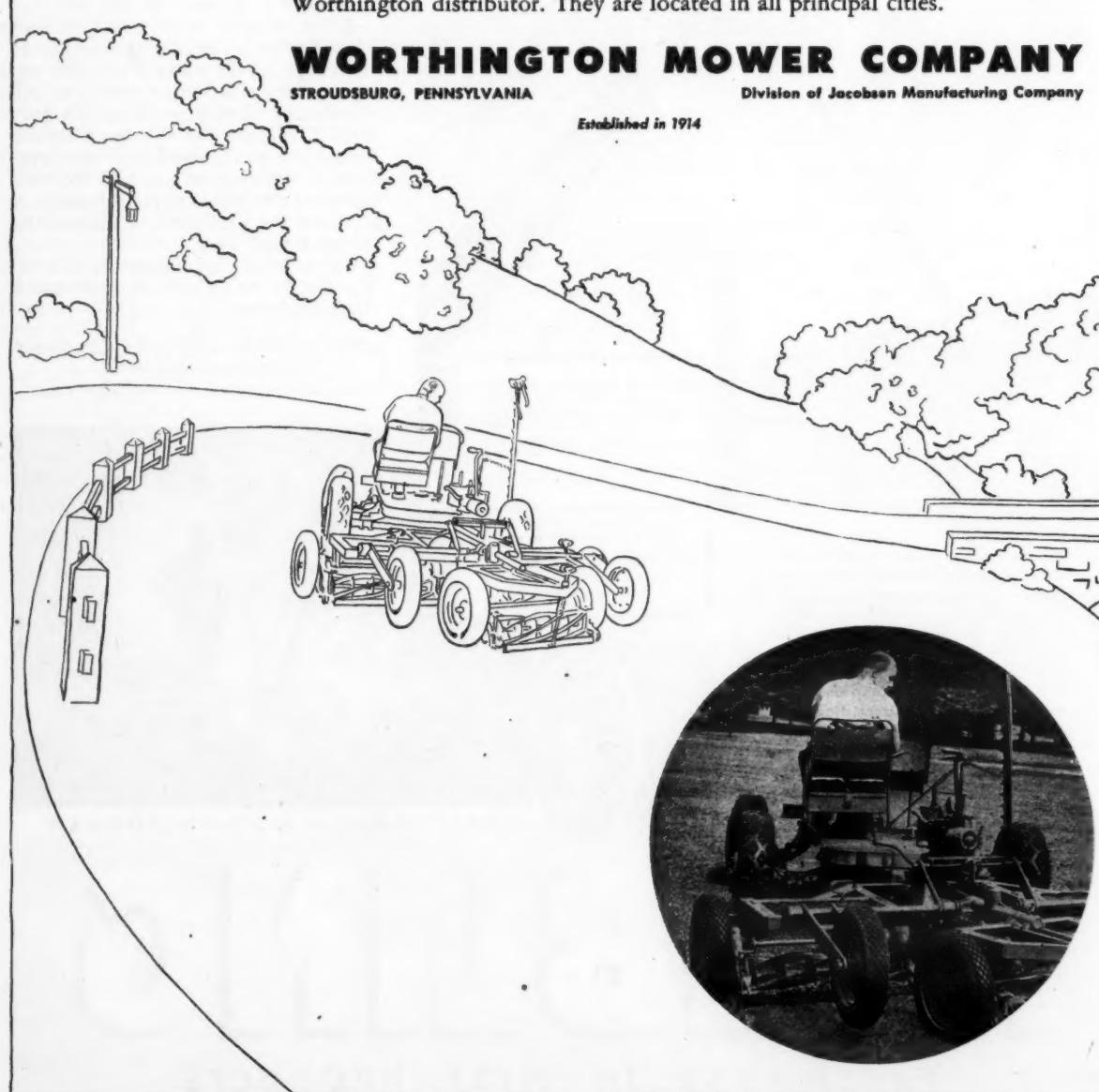
Because the "Highway Ranger" is built to stand cutting speeds up to 20 MPH and highway transportation speeds up to 45 MPH, it has at least 5 times the grass-cutting capacity of the tractor sickle-bar method. And, with the "Highway Ranger," you are not "wedded" to any one make of tractor; it can be quickly attached to any make or switched from one make to another. For more complete details, write to the Worthington plant in Stroudsburg, or phone your nearest Worthington distributor. They are located in all principal cities.

## WORTHINGTON MOWER COMPANY

STROUDSBURG, PENNSYLVANIA

Division of Jacobsen Manufacturing Company

Established in 1914



The swirling, chopping action of these blades mixes the materials without dislodging them on the road surface.

WHEREVER aggregates are used, such as all types of bitumens, cements, chlorides, clays, etc., ARIENS AGGMIXER is that equipment that will not only do the job thoroughly, rapidly but economically. You'll get more road completed per day. On one job it averaged an extra mile every 3 days as compared with the use of only graders. ARIENS AGGMIXER operates in conjunction with other general purpose road equipment thoroughly pulverizing, mixing and aerating the aggregates with the binder used. Safe and easy to operate, ARIENS AGGMIXER is adjustable to any tractor, with simple and positive hydraulic adjustment for depth, made in 4 sizes with normal cutting widths 4', 5', 6' and 7'.

Write today for complete information and job facts, with name of nearest distributor.

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## "Grader for Sale"

Caterpillar No. 10 Diesel Patrol. Excellent condition with nearly new tires. Phone or write, Beach Brothers, Harvard, Nebraska.



The shatterproof qualities of Flexiglass, made by Rohm & Haas Co., make it suitable for cab windows on construction equipment. This Byers excavator has a special full-vision window of this transparent plastic which had many wartime uses.

## Tractor Pipe Boom Has Separate Control

Tractor-mounted pipe booms are supplied in three sizes by the Superior Equipment Co. Built for International TracTracTors, the boom or load can be raised or lowered while the tractor is in motion. The load can be dropped instantly as well, Superior says, should the balance of the tractor be affected.

As mounted on the TD-9 and TD-14 crawler tractors, the standard boom is 13 feet long and the telescopic boom is 22 feet. On the TD-18, they are 16 feet and 22 feet respectively. The winch mounts on one side of the tractor, and the boom on the other. A Twin Disc clutch at the rear power take-off motivates the winch.

At a 4-foot overhang, the TD-9 unit has a capacity of 12,300 pounds with a 1,950-pound counterweight. The TD-14, using a 3,000-pound counterweight, has a 21,600-pound capacity. The TD-18 uses a 3,250-pound balancing weight to lift 28,700 pounds.

Full details about these pipe booms and the tractors on which they are mounted can be obtained from the Superior Equipment Co., Bucyrus, Ohio. Tell the firm you saw this notice.

## Record Attendance At ASTM Meeting

The American Society for Testing Materials held its annual meeting in Buffalo, N. Y. recently. The event attracted the second-largest attendance ever present at an ASTM gathering. Registration indicated intense interest in the group's work of setting up specifications and tests for materials and methods of evaluating assemblies of these materials.

The meeting's technical sessions were notable, eight symposiums being devoted to papers that covered a diversity of fields: bearings, gas-turbine materials, fatigue, spectroscopic light sources, oil - procurement practices, testing parts and assemblies, pH measurements, atmospheric weathering of corrosion-resistant steels, and freezing-thawing tests of concrete.

Other discussion centered around the effect of temperature on metals, cement and concrete, bituminous, and other materials. The Marburg Lecture, another feature of the meeting, was given by Dr. J. J. Mattiello of the Hilo Varnish Corp. on the topic "Protective Organic Coatings as Engineering Materials". An International Nickel Co. chemist, H. R. Copson, received the Dudley research medal.

The role of engineers and technicians in our national and international life was discussed by ASTM President J. R. Townsend at the annual-meeting dinner. The significance of the United States as a leader in developing and maintaining the philosophy of government that characterizes English-speaking nations was discussed by a Canadian editor, Dr. B. K. Sandwell.

spring meeting in Philadelphia. Technical committees gathered in more than 200 meetings to plan new specifications and tests. Their findings will appear in the 1946 Book of Standards to be published late this year.

The meeting approved 44 new tentative specifications and tests, and revised a large number of existing standards and tentatives. Adoption as "standard" was voted for 42 specifications and test methods on the tentative list.

Arthur W. Carpenter of the B. F. Goodrich Co. was named President of ASTM, to succeed Mr. Townsend, who is associated with the Bell Telephone Laboratories. R. L. Templin, Aluminum Co. of America, is the new Vice President to serve with Senior Vice President T. A. Boyd of General Motors. New Directors include A. G. Ashcroft, Alexander Smith & Sons Carpet Co.; A. T. Chameroy, Sears, Roebuck & Co.; J. H. Foote, Commonwealth & Southern Corp.; F. E. Richart, University of Illinois; and L. H. Winkler, Bethlehem Steel Co.

## Materials-Lifting Tower

Construction tower equipment built by the Archer Iron Works includes two sizes of tubular or pipe towers, and buckets and hoppers for use on wooden towers the contractor has built himself. The line also features a variety of spouting equipment. Full details on these various Archer products can be obtained by writing the firm at 2438 W. 34th Place, Chicago, Ill. Say you read this notice.

## Concrete-Vibrator Data

A flexible-shaft concrete vibrator is featured by the Jackson Vibrator Co. in a new brochure. The unit, a gasoline-driven model, has a 4-hp Wisconsin engine. It has a 7,000 to 7,500-vpm frequency, and can be supplied with several tool attachments besides the vibrator head. Jackson will be glad to tell you all about it. Write the firm at Ludington, Mich., and ask for Form FS-6A. Mention this report.

Paint and related topics came in for considerable study during the meeting. The society's committee on paint is to sponsor the symposium at the 1947



Why you should use a high quality motor oil for heavy duty service

Stanolube HD

LUBRICATION is the smallest part of operating costs on most fleets. But look what happens when you try

to cut costs on this small item. The chart above is based on cost surveys of many fleets. It illustrates how repair costs are low when lubricant quality is high—and how repair costs jump when lubricant cost is considered without regard to quality of motor oil, greases and gear lubricants.

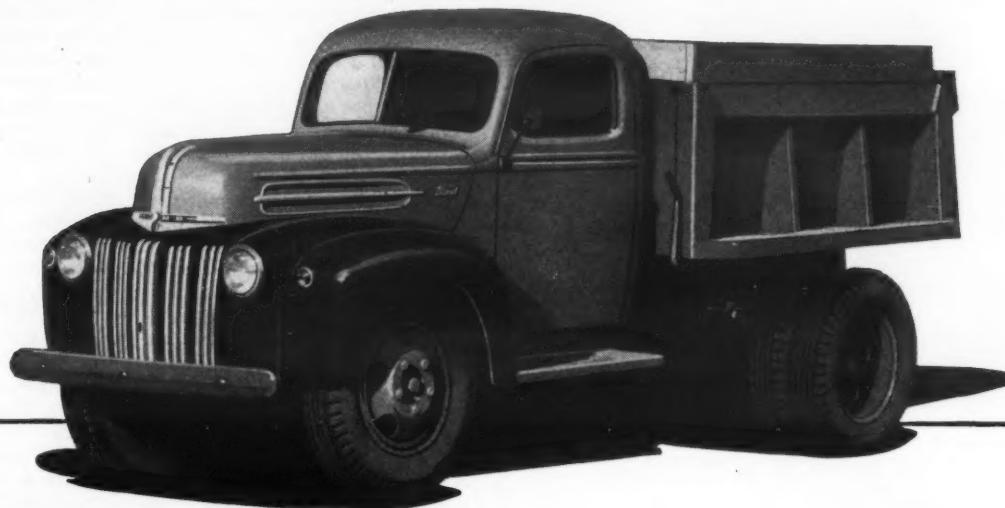
It illustrates one reason why you should use the best motor oil you can get for heavy duty fleet service—Stanolube HD.

Stanolube HD has the quality to reduce maintenance. It keeps engines clean, gives more miles of full power operation, fewer pull-ins and overhauls. Try Stanolube HD on some of your hardest worked gasoline or Diesel powered equipment. A Standard Oil Automotive Engineer can help you take full advantage of the maintenance-reducing quality of Stanolube HD. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

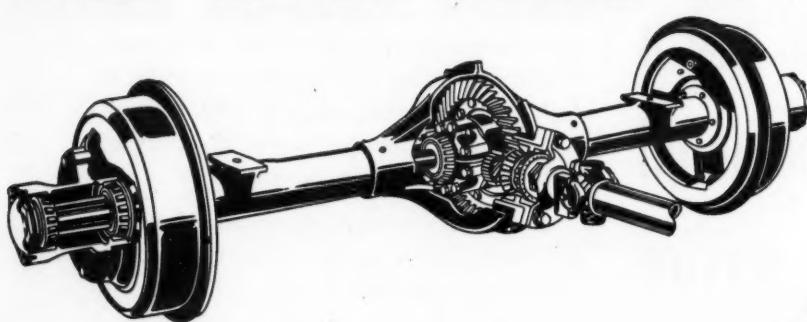
REGISTRATIONS SHOW IT—OPERATORS KNOW IT!



Dump Body by  
MARION METAL PRODUCTS CO.,  
Marion, O.

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One big reason—  
**FORD AXLES STAND UP!**



Ford Truck axle shafts carry no weight load, because *ALL* Ford Trucks have  $\frac{3}{4}$ -floating or full-floating axles. All weight stresses are carried on the axle housing—none on the shafts—minimizing shaft breakage. Driving pinion is straddle-mounted on 3 large roller bearings, maintaining positive mesh with ring gear—no destructive springing away under stress. Differentials have 4 sturdy pinions, even in light duty chassis, spreading the load and strain.

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ONLY in a Ford Truck will you find all these long-life features: your choice of two great truck engines, the 100-H.P. V-8 or 90-H.P. Six—triple-life Silvaloy V-8 rod bearings—Flightlight aluminum alloy, 4-ring pistons—efficient air- and oil-filtering—full pressure lubrication—heavy channel section frames, doubled between springs in heavy duty models—semi-centrifugal clutch—big hydraulic brakes, with non-warping, score-resistant cast

drum faces for maximum life. More than 50 such long-life features contribute to Ford Truck endurance . . . and that endurance is proved by the fact that 7 out of 11 of all Ford Trucks built since 1928 are still in use. See your Ford Dealer!

# **FORD TRUCKS**

MORE FORD TRUCKS IN USE TODAY THAN ANY OTHER MAKE



The Atkins chain saw is available in two-man and one-man models, for many cutting and clearing operations.

## New Chain Saw Does Many Forest Tasks

Falling, bucking, and limbing trees are among the duties performed by the Atkins chain saw, which is applicable to clearing work as well as to cutting timber or piles for use in construction. The saw is said to cut through redwood bark and pine limbs, and to give an added recovery of 6 per cent from stumpage.

Driven by a 10-hp electric motor that weighs 32 pounds, the Atkins gets its power from a Model W-100 power unit. This power source, built around a Wisconsin engine and Louis-Allis generator, is set on a base for mounting on trailer, truck, tractor, etc. It can be adapted to power take-off.

Among the features of the cutting mechanism, Atkins says that the cutter chain can be sharpened in about 20 minutes. The cutter bar is of special alloy steel, and the cutter chain of special patented design. Depth-gage teeth are used to prevent chatter or tipping as they pass through the cut, the firm says.

The saw is supplied in a two-man size that weighs 54 pounds, in a one-man model weighing 48 pounds, and in a deck-saw hook-up. Details of the various models are described and pictured in literature available on request from E. C. Atkins & Co. Write the firm at 402 So. Illinois St., Indianapolis 9, Ind., mentioning this notice.

## New Chemical Kills Weeds but Not Grass

"Spray your weed troubles away," the Dow Chemical Co. advises highway engineers, with the announcement of a new chemical weed killer. The killer is one of a group of chemicals used to influence plant growth. This chemical, 2,4-Dichlorophenoxyacetic acid, is better known (understandably so) as 2,4-D.

Developed only recently, 2,4-D was first reported "successful" in 1944, when New York State experimenters used it in a 1 to 1,000-part relation with water to eradicate bindweed from an apple plot. Further experimentation with the chemical last summer showed that, properly used, it will kill most weeds but will not injure most grasses.

Mixed with water in low concentrations, 2,4-D is sprayed over the weeded area. It is taken into the leaves, and is apparently spread to other parts of the plants. Acute curvature of the stems and leaves is the first response of the weeds. They then twist, curl, become distorted, and finally dry up and die. Even the roots are said to be permanently affected.

The 2-4 Dow weed killer is one of the formulations of 2,4-D made for the selective control of weeds. Available in liquid or powder form, it is used with water at a rate of about 200 gallons per acre, or enough to wet the foliage thoroughly without causing any appreciable run-off. Damage may result to other vegetation if directions are not strictly followed, and spraying equipment must

be carefully cleaned before re-use for other spraying purposes.

The Dow Chemical Co., Midland, Mich., will be glad to tell readers of CONTRACTORS AND ENGINEERS MONTHLY all about this new development. Mention this news story when writing to the firm.

## Sharpens Mower Blades

Sharpening mower blades at the rate of a foot a minute is said to be possible with the Edgemaster, an electrically operated machine made by the Pneu-Hydro Road Machinery Co., Cadillac, Mich. The device sharpens two cutting edges at a time as it travels along the mower blade. It is described in a mailing piece available from Pneu-Hydro on mention of this notice.

## Concrete-Curing Agent

A transparent membrane for curing concrete is made by The Carter-Waters Corp. of Kansas City. It is marketed in

the East as Hunt Clear Cure, and in the West as Hunt Process Clear. The product is manufactured in cooperation with the Hunt Process Co., which developed the original formula.

Bulletins describing this curing compound, its application by spraying, and other details, can be obtained by writing Carter-Waters. The firm is located at 2440 Pennway, Kansas City 8, Mo. Mention this review.

## Steel-Fabrication Firm

Steel-fabrication services of the Minweld Steel Co. are outlined in an illustrated folder issued by the firm. The organization devotes itself strictly to welding and fabricating steel. Copies of the folder can be obtained from the company at Shaler and Wabash Sts., Pittsburgh 20, Pa., on mention of this notice.

## There's Always a BEST WAY

That goes for snow clearance, too. It's no mere accident that DAVENPORT-FRINK SNO-PLOWS enjoy engineer-preference throughout the snow belt. They have won their spurs through Faster • Safer • Cleaner Snow Removal.

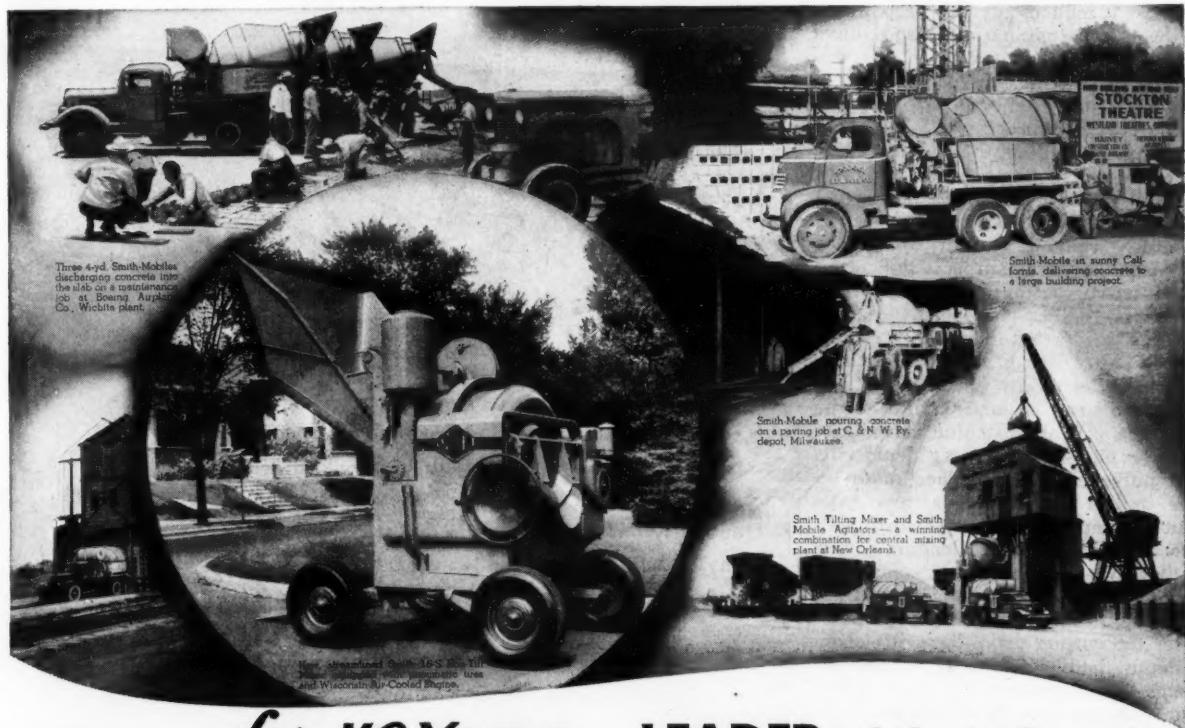
### ACT PROMPTLY

We'll be glad to give you complete information—the sooner the better, because, frankly, there'll be a waiting list. The early bird will get the Sno-Plow—and repair parts—unless steel starts coming through at a much faster pace.

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Made in Eastern U.S.A. by CARL H. FRINK, 1000 Islands, CLAYTON, NEW YORK



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In every section of America . . . and in most foreign countries . . . you'll find Smith Mixers and Smith-Mobile Truck Mixers producing big batches of uniform concrete on a fast production basis. Smith continues to be the first choice of experienced contractors and engineers. When faced with the problem of producing mass concrete on scheduled time, they generally specify Smith Mixers or Smith-Mobile Truck Mixers. These dependable machines are being built today better than ever, for big yardage and long life. Let Smith Engineers solve your concrete problems. Write today.

THE T. L. SMITH CO., 2857 N. 32nd Street, Milwaukee 10, Wis., U. S. A.





One of the new P&H soil stabilizers in action on an Iowa road job.

### A One-Pass Machine For Stabilized Roads

A new machine has been designed specifically for road-stabilization work by the Harnischfeger Corp. Introduced during the past year, it is now generally available.

As its name indicates, the P&H single-pass stabilizer features one-pass mixing. Because it reduces advance preparation of the soil to a minimum, it also reduces job costs, Harnischfeger says. It is designed to provide the basic requirements for stabilized-road building: accurate control of processing depth, thorough pulverization, uniform blending of materials, creation of a true subgrade, dispersion of the stabilizing agent through the entire volume in measured quantity, even mixing of the coated material, and laying the processed material ready for compaction.

The processing chamber is quickly and easily adjusted for depth throughout its entire length, the manufacturer says. Under positive control of the operator, it can be held parallel to the subgrade. As the machine moves forward, a high-speed cutting drum cuts and pulverizes the in-place material. The pulverized materials are then shuttled rapidly back and forth between the cutting and blending drums until they are turned over completely while being carried over the top of the blending drum to the twin pugmill. After the cutting drum has cut closely to depth, the blending drum shaves and cleans the subgrade to a uniform depth that conforms with the surface contour. Liquids are accurately measured. The operator can control their volume at all times while they are being atomized and spread by the spray system. The

materials are agitated and moved laterally while being mixed in the transverse twin pugmill. A tail-gate can be adjusted to control the volume being mixed there. Finally, the material—evenly mixed and in a thoroughly loosened condition—is deposited on the grade at a uniform depth. It is ready for immediate compaction.

Complete details on the design and operation of the P&H single-pass stabilizer can be obtained from the Harnischfeger Corp., 4419 W. National Ave., Milwaukee 14, Wis. Mention this CONTRACTORS AND ENGINEERS MONTHLY news report.

### Steel Posts Driven Into Frozen Ground

Snow-fence posts can be driven into frozen ground by a power-driven steel-post driver designed by a former highway employee and built by the Spencer Machine & Welding Works, Spencer, Iowa. Mounted on the rear of a truck, the unit can be driven from the power take-off or by a 2.3-hp gasoline engine.

The hammer, set in a welded steel frame, weighs 100 pounds, is 66 inches long, and has a drop varying from 2 to 34 inches. Spencer says it will drive posts in less than 10 strokes at a speed of 30 strokes per minute. The unit can be attached to a truck in about two

hours, and can then be removed and reattached in a matter of minutes. It has adjustable mounting brackets, and a safety lever for holding the hammer up when in travel.

A complete description of this steel-post driver can be obtained from the Murray Sales, Inc., 1006 Grand Ave., Sioux City, Iowa. Tell the firm you read about the driver in CONTRACTORS AND ENGINEERS MONTHLY.

### Spreader for Ice Control

According to a leaflet which describes the self-feeding Flink spreader for ice control, the width of material spread is independent of the carrying truck's speed. Hydraulically operated, the spreader replaces the truck tail-gate. A lever in the truck cab controls the spreader, which can be thrown in and out of action without stopping the truck.

The leaflet and further details about the Flink spreader can be obtained on mention of this notice, from The Flink Co., Dept. 4, Streator, Ill.

...this is a sample of the work done by this machine

Precision BLACK TOP PAVING

Adnun precision black top paving combines all the Adnun advantages to give you lowest cost\* finished roads and airports... And Adnun is the only paver that lays crushed rock, gravel, aggregate or soil cement with the same speed and easy one-man operation that it paves with any bituminous mix—hot or cold, light or heavy.

A powerful six-cylinder engine in a rugged cross-braced frame gives you power and strength to handle the heaviest trucks on any paving grade... Continuous Course Correction irons out subgrade irregularities... Power cut-off eliminates runouts and material waste when paving around objects and in tight spots... Adnun crowding-compacting cutter bar action insures smooth finished surfaces and does not segregate materials... This is a tough paver for years of fast, precision paving on the heaviest job schedules.

Get all the facts on Adnun Black Top Pavers from your Adnun Distributor—or write direct for new illustrated Adnun Catalog.

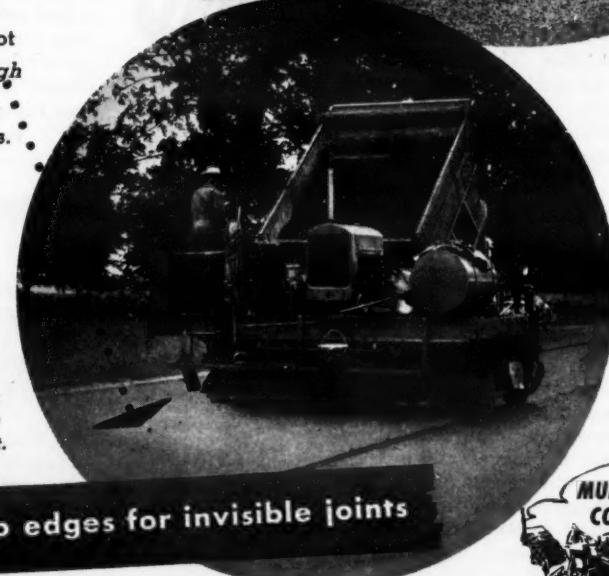
#### THE FOOTE CO., INC.

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\*Comparative records, kept by road builders who have used other black top pavers, show Adnun lowest in operating and maintenance costs. Figures on request.



sharp, accurate cut-off



clean, steep strip edges for invisible joints

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C. &amp; E. M. Photo

To seal the bedrock below Rector Creek Dam now under construction in California, holes along the center line of the dam were pressure-grouted. Here a hole is being drilled with a diamond-faced bit. In the background is a gage over a hole being filled with grout.

## New Earth-Fill Dam For Water Supply

**Clearing, Excavation For Foundation, Grouting Completed for Structure To Be 900 Feet Long**

THE hard work of building a dam generally consists of digging in to bedrock. Now, with this difficult phase of construction virtually finished, Rector Creek Dam in Napa County, Calif., is about ready to rise from the bedrock below Rector Creek and plug the gap between two hills. Pioneering, exploring, clearing, excavating to foundation, and grouting have been completed.

The Rector Creek Reservoir project is being constructed for the California State Department of Finance by the State Department of Public Works. Its purpose is the development of a water supply for four state institutions in the Napa Valley. The dam and appurtenances are being built by H. Earl Parker of Marysville and N. M. Ball Sons of Berkeley, Calif., who bid \$1,123,191 for the work. The need for such a dam and storage reservoir has been urgent for years. In the past, clear cold water from Rector Creek, which flows all year, has been diverted to a pipe line which carried it to the Napa State Farm, Game Farm, and Veteran's Home of California. With the completion of the reservoir, an adequate supply of water will be assured for these institutions and for the Napa State Hospital. This water will be used for domestic purposes, irrigation, and watering stock.

### Design of Dam

The new dam is being built along the eastern side of Napa Valley about 3 miles northeast of Yountville, 45 air-line miles from Sacramento. It will catch and store water from a drainage basin 10.7 square miles in area. The dam will have a crest length of 900 feet and a crest width of 30 feet. It will be built in five zones of rolled earth fill and cobbles, with 2½ to 1 side slopes both upstream and downstream.

The center zone, called Zone 1, is now ready to rise. It will be built from the best-quality clay soils available within a 5,000-foot radius of the dam, then rolled until it is impervious. It will contain very few rock fragments and will rest on bedrock.

Flanked upstream and downstream by Zone 2, the impervious core will be

bulwarked by a rolled earth and cobble fill containing rock particles up to but not over 5 inches in maximum dimension. This zone will have a slope of 0.75 to 1 where it meets the impervious material, with a 1.6 to 1 slope on its outer sides. Zone 3, which will be pervious, will be 2½ to 1 on the outside faces of the dam, and the rock will be sluiced to compact it as much as possible.

The foundation for the dam is solid, ranging from solid volcanic rock to compacted boulders and clay. Rector Dam is located at the upper end of an alluvial fan. In general, the depth of alluvial overburden above bedrock in the stream bed was only 30 feet, but in one area it had to be dug out to a depth of 65 feet below the original ground.

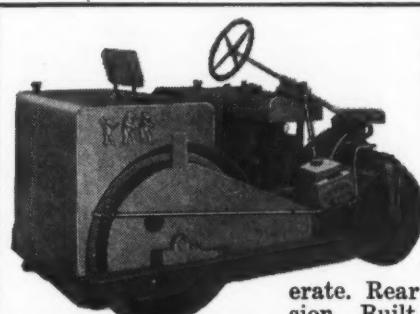
Bids were opened on December 12, 1945, after a four-year delay due to the war and rulings of the War Production Board. Funds have been approved by the State Legislature in the Statutes of 1941, but construction had been impossible for the next few years under

terms of the low priority issued by the WPB.

### Diversion of Rector Creek

Parker and Ball jumped the schedule

two months by arranging to divert Rector Creek through a 48-inch Calco corrugated-metal pipe. The inlet to a canal leading to this pipe was located about (Continued on next page)



## A TOUGH ROLLER FOR TOUGH JOBS

**Pierce-Bear 3 1/2-5 Tons Variable Weights**

Engineered for economical operation where the going is tough. Compact, easy to operate. Rear roller gives heavy duty compression. Built-in water tanks for wet rolling.

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COMPARE THE RESULTS OF THIS TYPICAL TEST BY AN UNBIASED ORGANIZATION\*

Test Data	LPC Carrimor	Scraper "A"	Scraper "B"
Struck Capacity	8.4 yds.	8.2 yds.	9.25 yds.
Loading Time	1.0 Min.	1.0 Min.	1.0 Min.
Spreading Time	.157 Min.	.172 Min.	.366 Min.
Turning & Travelling time considered as constant for purposes of computation	3.22 Min.	3.22 Min.	3.22 Min.
Total Trip Time	4.38 Min.	4.39 Min.	4.58 Min.
Weighed yds. per trip	7.3	6.1	6.0
Trips per 54 Minute Hr.	12.32	12.30	11.7
Total Yds. per Hr.	89.9	75.0	70.2
Total Yds. per 8-hr. Day	719	600	562

\*Name on request

Claims are easy and talk is cheap but if you want the real facts on which scraper will put the most money in your pocket, we suggest a competitive test with the new 8 yard LaPlant-Choate Carrimor.\*

For example, here are the results of a typical test, conducted by an unbiased organization with no connection with any scraper manufacturer. Every condition was carefully controlled to get as nearly a perfect comparison as possible—same operator, same material, same tractor, same haul and even the same loading time. But look at the difference in scraper production, based on actual weighed loads at the fill! At 25 cents per yard, the LPC Carrimor\* would earn \$29.00 per day more than scraper "A" and \$39.00 per day more than scraper "B".

With an opportunity for extra profits like these, isn't it worth waiting a little longer to be sure of a Carrimor—the scraper that's "best by competitive test." LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; 1022 77th Ave., Oakland, Calif.

\*Reg. U. S. Pat. Off.

**LaPLANT-CHOATE**  
Job-Proved Equipment... for lowest possible cost in Moving Earth



C. & E. M. Photo  
D. L. Ross is Resident Superintendent for the contractors for Rector Creek Dam in Napa County, Calif.

## New Earth-Fill Dam

(Continued from preceding page)

700 feet above the upstream toe of the dam, and the canal and pipe trained the creek to a discharge point near the downstream toe of the dam. By going that far ahead of the dam with the diversion, they obtained sufficient fall to carry the flow well above the existing creek channel. A peak of 1,028 cfs has been recorded on Rector Creek during floods. However, the normal flow through the 48-inch diversion pipe was only from 4 to 8 cfs during the unusually good weather in the spring months of 1946. The pipe was laid on a berm excavated in solid rock along the left abutment, where the spillway and permanent outlet works are also located. After the outlet tunnel, drilled through bedrock along the left abutment, has been finished, the present Rector Creek flow will be routed through it. Then the corrugated pipe will be removed. Excavation for the canal leading to the corrugated pipe was done by a Northwest 80-D machine, rigged as a dragline and swinging a 2½-cubic-yard Esco bucket.

The pipe diversion of the creek was augmented by the installation of two Jaeger 6-inch centrifugal unwatering pumps. These removed seep water from above the dam and from the bottom of the excavation and carried it, through a 6-inch pipe line, to the diversion pipe.

### Outlet Tunnel

Permanent provision for discharge from the reservoir consists of a 72-inch-diameter tunnel blasted through the left abutment rock and lined with concrete. This work was among the first items started soon after the contractors moved in, on January 7, 1946. Rock was removed by drilling horizontal holes in the face of the bore, loading them with 60 per cent gelatin, and shooting the center first, with delays on the shots towards the tunnel walls. In this manner the center was pulled first, and rock broken towards it.

When the tube had been trimmed to neat lines insofar as possible, the invert slab was poured throughout its 760-foot length. A 40-foot set of steel-lined wall forms was then brought in and installed at the inlet end. Concrete with only a 3-inch slump was pumped 750 feet, at the start, through a 6-inch steel pipe by means of a Rex Pumpcrete machine, and fed through the forms. Allowing for about a foot of bulkheading at each end of the form, approximately 38 linear feet of lining was stripped and poured in 8 hours. The concrete was allowed to set 16 hours. Then the forms were

stripped and moved ahead, and another pour made each day, shortening the line from the Pumpcrete machine. The finished lining is smooth, dense, and remarkably free from rock pockets or patchwork.

Water will later be carried through this tunnel in a 30-inch pipe. It will enter the pipe through one 30-inch and six 18-inch valves in the outlet tower.

### Clearing

The reservoir area, about 76 acres overall, was cleared under a separate contract. Live oak, alder, willow, and other creek-bottom trees were encountered. They were trimmed to ground level with power crosscut saws, and the brush piled. At the time the job was visited for CONTRACTORS AND ENGINEERS MONTHLY, arrangements were being completed with the U. S. Forest Service for burning.

### Excavation

The dam abutments, rising 200 feet  
(Continued on next page)

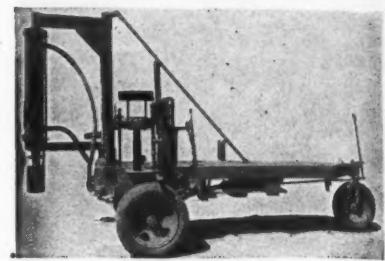


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Works Inside or Out

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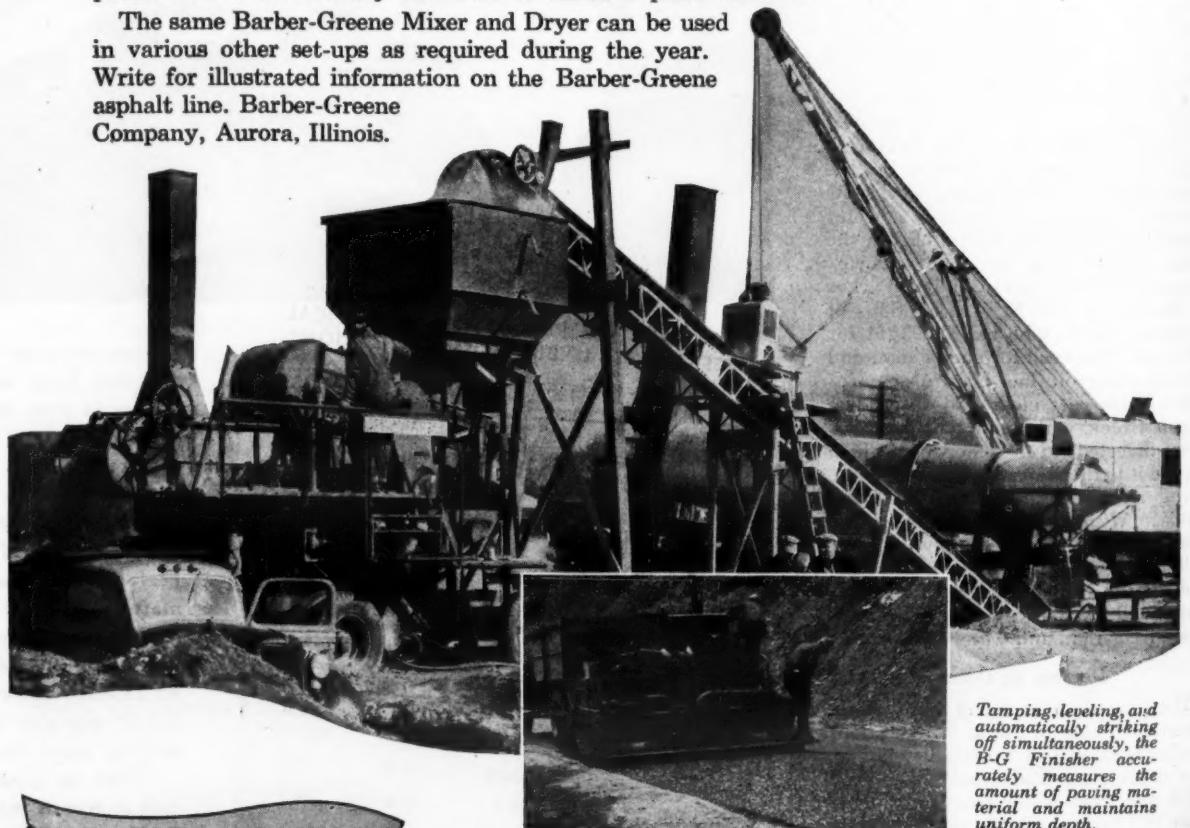


## How a Asphalt Plant Provides "Intermediate" Mixing

- For "intermediate" roads—roads having traffic too heavy for a travel plant mat, but not sufficient to warrant the high type, densely graded Class I mixes—the Barber-Greene Mixer and Dryer may be combined to provide a plant quality mix at 10 to 120 tons per hour, depending on size of units.

Moisture content—responsible for the failure of many secondary pavements—is positively controlled by the B-G Intermediate Plant. In addition, use of heavier bitumens is permitted, producing a higher quality surface than can be obtained with road mix. And frequently at comparable cost. Temperature control gives this B-G plant a wide range of application, from road mix types to high quality asphaltic concretes. High capacity and low erection costs make high quality pavements possible on roads formerly restricted to mixed-in-place surfaces.

The same Barber-Greene Mixer and Dryer can be used in various other set-ups as required during the year. Write for illustrated information on the Barber-Greene asphalt line. Barber-Greene Company, Aurora, Illinois.



Tamping, leveling, and automatically striking off simultaneously, the B-G Finisher accurately measures the amount of paving material and maintains uniform depth.



# New Earth-Fill Dam

(Continued from preceding page)

above the lowest point of excavation, posed a problem of access. Four Caterpillar-D8-mounted LeTourneau bulldozers were put to work pioneering the abutments. When they had opened up a road, four more D8's came in with LeTourneau NP and FP Carryalls. These machines started the excavation of clay overburden and loose rock, hauling it to a designated storage area near the dam toe. All excavation thus removed was stored for later use in Zones 2 and 3.

In excavating for the dam foundation in the bottom of the canyon, the Northwest 80-D dragline was re-rigged as a shovel, and put to work loading five 12-cubic-yard LeTourneau Tournatrailers. These machines also disposed of their loads on the storage pile. About 150,000 cubic yards of tough excavating was encountered below the 260 contour line along the right abutment, and below the 250 contour line on the left side of the dam. This excavation was mostly alluvial boulders in a dense, wet clay. So firmly were the boulders embedded that the shovel teeth on the Northwest 80-D split many a rock before it would dislodge. The unit bid price on this item of excavation was 31½ cents per cubic yard. When one considers the type of material, the rough haul to the storage pile with steep grades involved, and the wear and tear on equipment, he can visualize the close figuring and excellent management which brought this item out "in the black" two months ahead of schedule.

Incidentally, when this material was put back as a part of fill this summer, the same equipment was used along with other new equipment. The new machines included four Wooldridge Terra-Cobra rubber-mounted scrapers, 12 Caterpillar DW-10 hauling wagons for hauling impervious clay to Zone 1, and another Northwest 80-D shovel.

The shovel was used only as long as it could load economically. The final stripping near bedrock was done by a 1-cubic-yard P&H dragline. This machine loaded into one of the Tournatrailers, and picked the rest of the overburden out of places the shovel could hardly reach. A crew of men working with a pair of hydraulic nozzles, under pressure, sluiced the dirt off the bedrock near the dragline, washing it clean, and piling the sand and gravel so the dragline could pick it up.

Water for this operation was taken from the creek diversion pipe by a 4-inch Fairbanks-Morse centrifugal pump, driven by a John Deere agricultural tractor, and transmitted by means of pipe and flexible hose. A laborer worked with each pair of nozzle men to keep the hose brought up close. Two nozzle men were needed on each stream of water to control the upthrust due to pressure. One of the contract specifications stipulated that the bedrock had to be cleaned thoroughly by washing or brushing before it was acceptable.

## Pressure Grouting

In order to seal the bedrock below the dam and make it a monolithic mass



C. & E. M. Photo  
Calco 48-inch corrugated-metal pipe was used to divert Rector Creek during the early days of work at the dam site. Excavation to bedrock is seen in the center.

free from cracks or seepage seams, the State of California specified certain

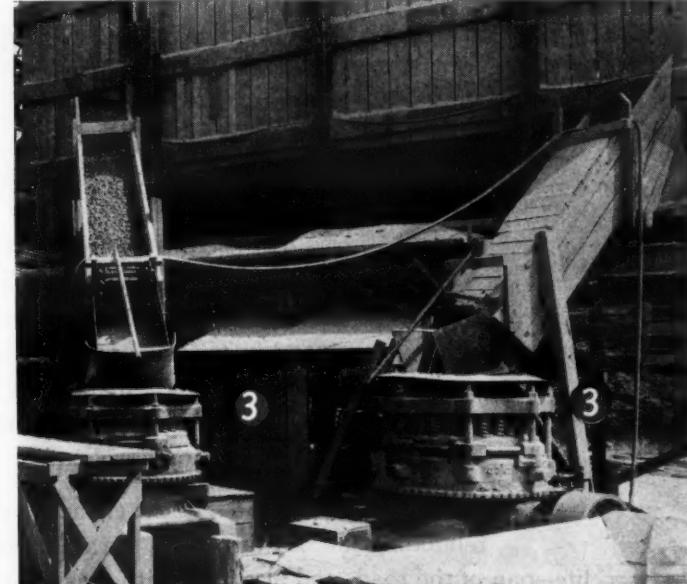
pressure-grouted holes along the center line of the dam. These holes were

spaced about 20 feet apart. They started high up on both abutments and continued towards the center of the dam where the elevation was low.

Two Chicago Pneumatic No. 5 compressed-air drills, using CP steel and detachable diamond-faced drill bits, were used for sinking these holes. They were drilled 100 feet below bedrock wherever they happened to be. The seismic fault along the center line, near the place most of these holes went down, was not regarded as serious. Detachable bits were 1½ inches in diameter, and lasted only from 30 to 45 feet of drilling before they were worn out. The rock was quite abrasive, and was seamed enough that small pebbles sometimes got down ahead of the diamond drills and raised hob with them.

In any case, the bits lasted about 8 hours, and 40 linear feet of hole in that length of time was customary. The holes were washed with water while drilling was in progress.

Immediately prior to the pressure  
(Continued on next page)



60 tons of  $-7/16$  per hr... that's outstanding volume for hard, tough trap rock! But this Telsmith-modernized plant is turning it out for the Arlington Stone Co. of Leesburg, Va. Of this 60 tons of  $-7/16$  per hour, over two-thirds is  $3/16$  to  $7/16$  chips.

This extremely flexible Telsmith plant produces every size to meet the very exacting requirements of bituminous surfacing specifications—including 2" ballast rock,  $+3/4$ " to  $1$ ",  $+1/2$ " to  $3/4$ ",  $+3/16$ " to  $1/2$ " stone, and  $-3/16$ " dust. Its 8-hr. capacity is 580 tons of  $+1/2$ " to  $3/4$ " chips; 480 tons of  $+3/16$ " to  $1/2$ " chips.

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Q-16

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## New Earth-Fill Dam

(Continued from preceding page)

grouting of these holes, they were washed under 50-psi pressure with clean water. This was done about 15 minutes, to clean the rock pores and open up the seams. Grout was then applied at the rate of one sack of cement per 5 cubic feet of water, by means of a Worthington single-stage pump operated by a Chicago Pneumatic 365-cfm air compressor. After grout had gone in until it was believed the fissures were almost sealed, the mix was thickened considerably to seal off the top.

A rather neat job device was developed in connection with pressure grouting. This was a self-sealing connection which fit the top of the grout hole, and prevented any of the mix from escaping out the top of the ground. A 14-inch length of 1-inch pipe was used to make this device, and 1½-inch-OD pipe nipples were then welded to the outside of the pipe. Leather cups were placed between the pipe nipples, with just enough clearance to slide down the drilled hole. When grout pressure or water pressure was applied, these leathers opened up against the drilled sides of the hole. They prevented anything from escaping, even though pressures up to 125 psi were used on grout. One hole took 80 sacks of cement, but another took only 10. This was not entirely unexpected, however, for the number of seams in the bedrock varied by about that same proportion.

The 6 x 4 x 6-inch Worthington pump also was fitted with a simple but ingenious lubricating device. Ordinarily operated by steam, this pump would have received its lubrication from steam cylinder oil suspended in the steam lines. When air was used instead, the grout men capped both ends of a 1½-inch pipe about 12 inches long, tapped two spigots in each end, filled the cylinder with lubricating oil, and suspended it horizontally over the plunger rods. The spigots were slightly opened, and oil dripped at regular intervals down on the push rods of the pump.

### The Spillway

The Rector Dam spillway, cut through solid rock along the left abutment, was the hardest part of all excavation with the possible exception of the outlet tunnel. With a variable slope of from 0.1064 to 0.300, it was much too steep to be cut with a power shovel; a power shovel will not climb that kind of grade. The backslopes of the spillway cut were gouged out on a ½ to 1 ratio. Since the contract called for payment for concrete only to neat excavation lines, it was necessary for the contractor to dig the rock almost as close as if he had been excavating dirt.

Jackhammers, wagon drills, and compressors were used. It is impossible to tell accurately just how this cut was removed, for a number of schemes were tried. Tractor-drawn rippers and scrapers handled most of the material in the early part of this cut; dynamite and No. 6 Atlas Flo-Dyn powder had their day; and a Caterpillar-D8-mounted bulldozer also helped out. For the final clean-up, the bulldozer shoved the re-



C. & E. M. Photo

Workmen with hydraulic nozzles remove all loose dirt and scale from the bedrock at the site of Rector Creek Dam. Water for the operation was taken from the creek by a Fairbanks-Morse 4-inch centrifugal pump.

mainder of the rock down to the bottom where it could be picked up and hauled

away. Almost 82,000 cubic yards of rock was hacked out. Towards the last, when

the side slopes were being trimmed, men with jackhammers and rock gads chiseled each small promontory away, slowly and tediously. Such sights as this make one appreciate, when dams are built through solid rock, some of the difficulties to be overcome.

Later, when the spillway cut is encased in concrete, the sweat and labor necessary to gouge it out of the left abutment will become a legend that only those who had a part in it will remember always.

### Equipment Upkeep

Equipment which was worked so hard in rock had to get the best of care to keep it operating. An equipment-repair shop was set up below the dam, near the excavation storage pile. Here all routine repairs and overhauls are made. The equipment shed is divided; about two-thirds of its area is a repair shop, and the other third is a storage space for spare parts for the equipment.

A truck-mounted Alemite pressure

(Concluded on next page)

## A FEW FEET WIDER MEANS MANY YEARS LONGER



Are some of your roads too narrow to handle safely today's heavier, faster-moving traffic? Here's a quick and inexpensive way to widen them. For Tarvia\* road tar, or Tarvia-lithic\*, makes this a simple operation.

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Winnipeg • Vancouver

**New Earth-Fill Dam**

(Continued from preceding page)

unit services tractors, shovels, and haul wagons on the job once each 8-hour shift. Diesel fuel and gasoline for light plants are also trucked out on the dam. Fuel and oil filters, and all the host of minor repair parts necessary to keep a piece of equipment operating, are taken out the same way.

With many jagged rock edges exposed along the dam, punctured earth-mover tires were no rarity. They were changed

at the equipment shop with the aid of a 2-ton overhead chain hoist, mounted on rails and able to travel the length of the shop. Other repair facilities in this shed include the following:

- 2 General Electric arc-welding machines
- 2 oxy-acetylene outfits
- 1 Gardner-Denver air compressor, 5-hp G-E motor
- 1 Utility ball-bearing grinder
- 1 Kohler 5-kw light plant
- 2 bench vises
- Heavy-duty sockets and other machine tools.

The sides of the equipment shed are fairly plastered with recent safety posters, and plenty of hard hats and sanitary drinking fountains were seen

on this job. Safety, it seems, is being practiced here; not merely discussed.

**Personnel**

C. H. Purcell, California Director of Public Works, has jurisdiction over Rector Creek Dam. The work is being done under the general direction of Edward Hyatt, State Engineer, and A. D. Edmonston, Deputy State Engineer. T. B. Waddell is the Supervising Engineer, with Medill P. Thiebaud, Assistant Hydraulic Engineer, as Resident Engineer.

For the contractors, M. L. Simpson is General Superintendent, with D. L. Ross as Resident Superintendent. C. W. Story is the Master Mechanic.

**Beckwith Adds Tire Line**

The addition of Goodyear off-the-road tires to the list of products which it now carries has been announced by the Beckwith Machinery Co., equipment distributors with offices in Pittsburgh, Harrisburg, Wilkes-Barre, and Bradford, Pa.

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The new streamlined line of Joyce Liftmaster jacks contains six sizes, in capacities of 3 to 30 tons.

### Hydraulic Hand Jack Has Modern Design

Simple, streamlined, modern construction is said to feature a new line of hydraulic hand jacks announced by the Joyce-Cridland Co. The line has six sizes, in capacities ranging from 3 to 30 tons.

The bases of these Liftmaster Nu-Hydro jacks are made entirely of forged steel. The pump piston is of hardened tool steel ground to a high polish. A bronze guide bearing with a long bearing surface is used at the bottom of the precision-ground ram. The forged-steel ram cap is designed for maximum load contact and safety against slippage. Few drilled holes and no cotter keys are found in this new jack, Joyce-Cridland says. Its knurled handle is of the interlocking type and is 20 inches long.

The Liftmasters are described in a new bulletin, 190-J, issued by the manufacturer. Readers of CONTRACTORS AND ENGINEERS MONTHLY can obtain this bulletin by writing to the firm at 2027 E. First St., Dayton 3, Ohio.

### Problems in Northwest Discussed at ASCE Meeting

Future construction activities in the Pacific Northwest were the principal topics of discussion as the American Society of Civil Engineers held its annual convention at Spokane, Wash., July 17 to 20. Irrigation, reclamation, power, waterways, navigation, and flood-control themes featured the meeting.

Eight technical sessions followed a quarterly meeting of the ASCE Board of Directors and a conference of the fifteen western local section representatives. The session closed with an inspection trip to Grand Coulee Dam.

Among the papers presented were: "National Reclamation", John W. Haw, Northern Pacific Railway; "The Columbia Basin Project", Frank A. Banks, Bureau of Reclamation; "Irrigation West of the Cascades", Lee McAllister, Bureau of Reclamation; "Improvements of the Columbia River for Navigation", R. E. Hickson, U.S.E.D.; and "The Value of Storage for Power in the Columbia River Basin", B. E. Torpen, U.S.E.D.

New methods for keeping irrigation ditches free of silt, sand, and gravel were outlined by H. A. Burt, Public Service Co. of Colorado. Flood-control problems were discussed by Col. O. E. Walsh. The U.S.E.D. report on the Columbia River Basin was rendered by Col. C. P. Hardy. Stream-flow forecasting for irrigation was described by R. A. Work of the Soil Conservation Service.

Lessons learned from the failure of the Tacoma Narrows Bridge were discussed by Professor F. B. Farquharson of the University of Washington, C. E.

Andrew, consulting engineer, and Dexter R. Smith, designing engineer, both with the Washington Toll Bridge Authority.

### Sensitive Altimeter Has High Accuracy

An accuracy of better than one part in 1,000 throughout its entire range is claimed for the SA series of surveying altimeters by the American Paulin System. Made in Sweden before the war, the instruments are now being produced exclusively in the United States.

Paulin aneroid altimeters eliminate all gears, pivots, chains, and pinions. This minimizes the friction that can detract from the sensitivity of the instrument. It permits readings without lag and without loss of sensitivity and accuracy, the American Paulin System claims. Laboratory tests indicate a response to elevation changes in inches, with a sensitivity of better than one to 12,000, it is said.

The new SA series is offered in several models to cover all ranges of elevation, above and below sea level. Built for rugged field duty, the instrument is supplied in a leather carrying case. The dial is 4 1/4 inches in diameter. Indicators are knife-edged, with needle-point

design and mirror to eliminate parallax. The unit weighs 2 pounds complete.

The American Paulin System, 1847 So. Flower St., Los Angeles, Calif., will be glad to give you further details. Say you saw this notice in CONTRACTORS AND ENGINEERS MONTHLY.



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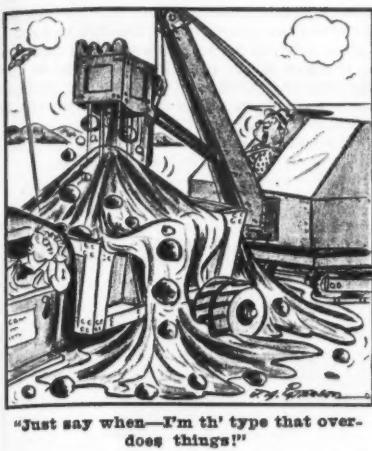
A "flying" project from the start! Four A-C torque converter tractors really make the dirt fly on this million yd. airport project at Greenbelt, Md. Owner F. W. Schrom also speeds maintenance and finishing with an Allis-Chalmers Model A-D Motor Grader.



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## F-A Highways Exempt From Steelman Order

The much discussed Steelman order declaring a moratorium on Federal construction does not appreciably affect the Federal-Aid highway program, the Public Roads Administration says in an official announcement.

The order contains no direct reference to highways and will not affect projects where commitments have been made, PRA says. Any project programmed with the PRA, regardless of its status, is considered a commitment and will be allowed to proceed.

The exact status of projects not yet programmed has still to be clarified. But the Steelman order does not affect the preparation of surveys or plans, and highway departments are urged by PRA to expedite advance planning.

PRA has reiterated its policy of disapproving projects that exceed 50 per cent of 1940 prices, and will adhere even more closely to it in the future. Projects involving structural steel should be wholly eliminated, it has informed the state highway departments.

## Holes, Washers Cut By Heavy-Duty Tool

A new shop tool, a heavy-duty hole and washer cutter, has been released by Wyzenbeek & Staff of Chicago. The new Wyco will cut holes and washers from steel plate, or other materials up to a  $\frac{1}{2}$ -inch thickness.

It is built to fit a 1-inch drill chuck, but it can be supplied with a Morse taper shank. High-speed cutting blades are adjustable from  $4\frac{1}{2}$  to 10-inch diameters. The  $\frac{1}{2}$ -inch pilot pin is of hardened steel, or a pilot drill may be used instead.

Details of this new Wyco tool can be secured by addressing a postcard to Wyzenbeek & Staff, Inc., 838 W. Hubbard St., Chicago 22, Ill. Just mention this item.

## Dummy-Joint Information

The value of dummy joints in controlling road cracks is pointed out in a bulletin issued by the Flexible Road Joint Machine Co. The 8-page folder gives suggestions about installing the various types of joints, relates the evolution of joints in concrete pavements, and presents designs for intersection jointing. Flex-Plane joint-installing machines are shown.

Copies of Bulletin E-11 can be obtained by highway engineers and contractors who mention this report. Write the firm at Warren, Ohio.

## Gerow Gets Insley Post

L. C. Gerow has been appointed Manager of the Parts and Field Service Department of the Insley Mfg. Corp., maker of excavating, material-handling, and concrete equipment. Formerly the firm's Chief Inspector, he succeeds the late Charles A. Menefee. Mr. Gerow was recently released from Army duty with the Cincinnati Ordnance District.

## Compact Vulcanizer Repairs Tire Tubes

Contractors and highway engineers will be interested in a new product being marketed to operators of truck fleets by the Inland Rubber Corp. The product is a tube-vulcanizing unit, which is both compact and easy to handle, Inland says. It can be used when repairing either natural or synthetic rubber tubes.

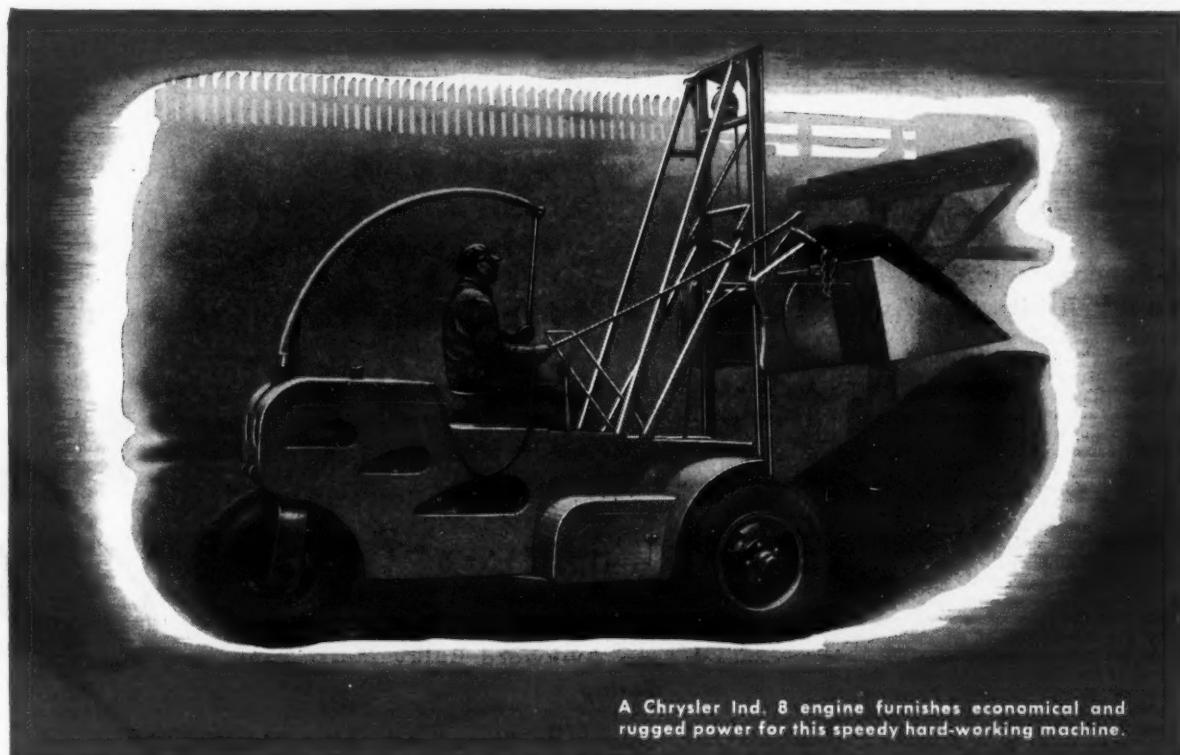
Known as the Inland Unit No. 5, the vulcanizer is supplied complete with accessories and materials, including a block and two pads, vulcanizing gum and cement, patching sheets, etc. With it, one can repair valve stems and other tube injuries up to 6 inches in length. The unit operates on 110-volt current.

Details of this new tube-repair kit and vulcanizing unit can be obtained by readers of CONTRACTORS AND ENGINEERS MONTHLY. Simply write the Inland Rubber Corp., 33 So. Clark St., Chicago 3, Ill., and mention this news report.

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# Avoid Legal Pitfalls

Edited by A. L. H. STREET, Attorney-at-Law

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

## Who Has Power to Award Contracts for Road Work?

History does not seem to record that any one of the numerous people who have bought the Brooklyn Bridge from a chance stranger was a contractor. But cases could be cited in which contractors, to their disadvantage, have erroneously assumed that certain public officers were empowered to award contracts for road work.

To illustrate, a county board might award a contract for the repair or improvement of a road lying within the county yet leave the contractor out on a limb. In a Texas case, it was decided that a county board had no right to award a contract covering a section of state highway, without sanction of the State Highway Department. (Iverson v. Dallas County, 110 S. W. 2d, 255.) To the same effect is a decision of the Arkansas Supreme Court (Taylor v. Rogers, 2 S. W. 2d, 56.)

And even where there is no doubt that a certain board or council has power to make a particular contract, the contractor should beware of attempts made by the board or council to delegate to one of its members the power to make a contract. For example, in a North Dakota case, a bank, which held assigned claims for road work done at the instance of one member of a county board, was denied right to recover from the county, although a local statute empowered the board to delegate to its several members supervision over road work. (Rolette State Bank v. Rolette County, 218 N. W. 637.)

## Sub-Subcontractor Contests Faulty Arbitration Award

What are the circumstances under which a party to a construction job can litigate in the courts a claim previously decided against him by arbitrators? What if the arbitrators purported to act, but acted erroneously, under the terms of a contract? These questions were considered by the Virginia Supreme Court of Appeals in the case of Sydnor Pump & Well Co. v. County School Board, 182 Va. 156, 28 S. E. 2d, 33.

The School Board let a building contract. The general contractor sublet portions of the work, including drilling of a well. The subcontractor sub-sublet the well job. The sub-subcontract was so tied into the other contracts that the price of the well was to be paid by the subcontractor, who would pass it on to the general contractor, who would pass it on to the School Board. After the job was finished, the subcontractor approved the sub-subcontractor's bill as conforming to agreement, but the School Board insisted that the computation was wrong.

It was an interesting dispute. The contract provided for computation of payment for the well as follows: \$200 for the first 200 feet (the estimated depth), \$6 per foot for drilling in rock, and \$6 per foot for drilling below 200 feet. The well contractor had, in fact, to dig to a depth of nearly 400 feet. The School Board then claimed that for drilling below 200 feet he was entitled to but a single charge, \$6 per foot, regardless of whether or not rock was encountered. The well contractor, however, contended that he was entitled to pay on two bases: \$6 per foot for all rock encountered above and below the 200-foot level, and \$6 per foot for all drilling below 200 feet.

Being unable to pass the disputed amount on to the general contractor, the subcontractor refused to pay, although he had approved the bill. The sub-subcontractor therefore applied for arbitration under the general contract. But the arbitrators disregarded the fact that the dispute existed primarily between the sub-subcontractor and the subcontractor. They treated it as a contest purely between the School Board, who ultimately would pay, and the general contractor. The arbitrators "shushed" the sub-subcontractor's official when he asked to be heard, and finally decided that the Board owed the general contractor a certain sum. This was arrived at with complete disregard for the sub-subcontractor's insistence that he was entitled to one \$6-per-foot allowance for rock drilling and another \$6 per foot for drilling an extra 200 feet.

Thereupon the subcontractor stood pat on his refusal to settle with the sub-subcontractor on the double basis. So the sub-subcontractor sued all hands to have the arbitration vacated and to secure judgement against the subcontractor for \$1,212.20 which remained due on the bill submitted. The Supreme Court of Appeals decided that the arbitration award was void because made under mistaken belief of the arbitrators that the sub-subcontractor was not a party to the contest. It ordered judgement against the subcontractor for the amount sued for, because that was

what remained unpaid on a bill which he owed and which he had admitted was computed according to contract. Here is a summary of the court's conclusions on the general subject of arbitration of disputes under construction and other contracts:

"So it now appears that the purpose of the arbitration, which was to eliminate litigation and its attendant costs and delay, has been defeated. The parties . . . have been for three years in litigation. What they thought would be a quick and inexpensive way of settling the issues of law and fact between them perhaps has resulted in more delay and costs than would have been incurred if they had sought to settle their differences in a court in the first instance." To support this "plug" in favor of lawsuits, the court quoted a suggestion by the Pennsylvania Supreme Court that litigants are apt to better appreciate that "the ancient method of trial in duly constituted courts of law is a more satisfactory way to settle controversies" after they

have once been through a lawsuit arising out of abortive arbitration.

Concerning the essentials of valid arbitration, the Virginia court said in part:

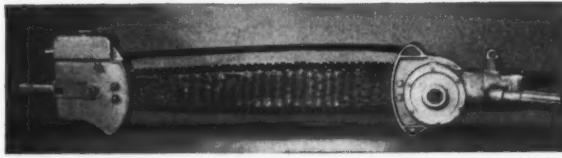
"The general rule is that an award will not be set aside for a mistake of law or fact where the arbitrators are made the judges of the law and fact by the submission. . . . However, there are exceptions to the general

rule. A notable one is where the mistake has thwarted the intention of the arbitrators. If the award is to operate in a way not intended by them or if the mistake is a palpable one, admitted by them, and occurring through misapprehension or inadvertence, it will be set aside. . . .

"It certainly cannot be said that the arbiter . . .

(Concluded on next page)

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## Avoid Legal Pitfalls

(Continued from preceding page)

trators intended to arbitrate controverted claims when two of them testify that there was nothing to arbitrate. . . .

"Generally, extrinsic evidence cannot be admitted to alter an award, and their award is the best evidence of the matters determined by the arbitrators. It is said to be conclusive of all matters contained in it, provided the arbitrators have not exceeded the powers delegated to them by the submission.

"However, the arbitrators may testify and extrinsic evidence may be admitted to show that the award was a nullity. Here such testimony was proper to show that the arbitrators were mistaken in their view of the extent of their powers; that they received no evidence whatever; that they mistakenly relied solely, as a basis for the award, upon the statement of counsel for the School Board and Mr. Atkinson (the general contractor) neither of whom were witnesses; that inasmuch as there was no disagreement between the Board and the general contractor "there was nothing to arbitrate. This testimony conclusively shows that no valid award could have been made" that would bind the sub-subcontractor.

### When Bid and Contract Differ, Contract Governs

Bidding specifications on a Government construction job contained the following provision: \$20 per day was to be awarded against the contractor for unexcused delay in completing *each of two buildings* which the contract would cover. But the contract which was awarded to the successful bidder provided for \$20 liquidated damages "for each calendar day of delay until the work is completed". The contractor was 126 days late in completing one building and 132 days late in completing the other. The Government's contracting officer deducted damages for only 126 days. The Comptroller overruled him, computing damages at 258 days, 126 days for the first building and 132 for the second. But the United States Court of Claims overruled both officials. It decided that the basic period of delay was the 132 days which covered the job as a whole to its completion. Said the court: "The contract did not follow the invitation for bids and it is, of course, the contract and not the preliminaries to its execution that governs the rights of the parties." (Manufacturers' Casualty Ins. Co. v. United States, 63 Fed. Supp. 759.)

### Revised Specifications Are Not Same As "Extras"

A subcontract under a Government construction project called for installation of a central steam-heating plant. It required "all claims for extras of every kind and nature" to be filed "within one week from the date that said claimed extra is incurred". In the case of *Anderson v. United States*, 151 Fed. 2d, 945, the United States Circuit Court of Appeals, Ninth Circuit, distinguished between extras and revised specifications. It decided that the clause did not cover the subcontractor's claim for installation of more expensive boilers than were called for by the original contract—that the boilers constituted revised specifications, not extras. Said the court in definition: "The extras referred to are matters arising in the course of construction, and not those provided for in a written agreement made prior to construction. Here there was such agreement." However, the court ruled that correspondence between the contractor and the subcontractor, providing for substitution of these more expensive boilers, in effect created a second contract, and that under this contract the subcontractor became entitled to the compensation it provided.

### Collisions on Roads Under Construction

A road contractor's truck driver omitted to place flares while he was trying to recouple a compressor, which had become unhooked while he was towing it. As darkness was coming on, plaintiff's automobile collided with the compressor. Plaintiff and a passenger in his car were declared entitled to recover damages from the contracting

company, in a decision rendered by the New Hampshire Supreme Court (*Everett v. Littleton*, 46 Atl. 2d, 317.)

Plaintiff had approached the scene of the accident on a paved road that was under construction and was not declared open to traffic until three days after the accident. However, the court decided that this did not necessarily affect the contractor's liability. There was no statute that made unlawful any travel on the road under

construction in violation of the engineer's order. Furthermore, the compressor was not on that road but on another highway with which it joined, and which was open to travel. It was for the jury to determine whether the truck driver's negligence was the direct cause of the accident, or whether the cause lay in plaintiff's failure to drive with reasonable caution. The court upheld the jury's determination of those questions in favor of plaintiff and his passenger.

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A complete line of Hercules gasoline and diesel power units, as well as replacement parts for the various models of gasoline and diesel engines, will be kept in stock at the new branch, 2065 E. 37th St., Los Angeles. W. W. Cromley is Vice President in charge of west-coast operations. His aides include Oliver Kelly, Herbert Wirshing, and Walter Batty.

The California dealers who will carry

Hercules products and supply parts, and take care of servicing and maintenance, are the following: Bay Engine & Parts Co., San Francisco; Brown-Bevis Equipment Co., Los Angeles; and H & B Sales Co., Long Beach. The others are: Loggers & Contractors Machinery Co., Portland, Oreg.; Star Machinery Co., Seattle, Wash.; Sawtooth Co., Boise, Idaho; and the Hayes Mfg. Co., Vancouver, B. C. The Engine Supply Co. of Denver will serve Colorado, and the Diesel Motor & Equipment Co. of Phoenix will serve Arizona.

**Paver Features Detailed**

The many construction features of the Koehring 34-E Twinbatch paver are detailed in a brochure available to

readers of CONTRACTORS AND ENGINEERS MONTHLY on request. Included in the 14-page brochure are a diagrammatic representation of the mixing controls and detailed specifications. The paver has a 34-cubic-foot capacity plus 10 per cent.

Write to the Koehring Co. at 3026 W. Concordia Ave., Milwaukee 10, Wis., for Bulletin 172. Mention this notice.

**Goodyear Staff Shifts**

Personnel changes in its South-Central Sales Division have been announced by the Goodyear Tire & Rubber Co., Akron, Ohio. W. A. Lovett, District Manager at San Antonio, has been given similar duties at New Orleans, on the resignation of R. J. Tho-

man to found his own business. Lovett has been succeeded at San Antonio by L. W. C. Dye, Assistant District Manager at Kansas City. Dye has been replaced by O. S. Whitaker, formerly South-Central Assistant Manager at Dallas.

**Highway Safety Guards**

Safety on the highway is the topic of an 8-page brochure issued by the Tuthill Spring Co. The bulletin features the spring-mounted convexed steel Highway Guard, used on curves, shoulders, and bridges, and the Hyway Divider, for middle-of-the-road protection. Copies of the bulletin can be secured on mention of this report. Write Tuthill at 762 Polk St., Chicago 7, Ill.

# ALL WHEEL DRIVE



**"Moves Peak Pay Loads at Rock Bottom Cost"**



The true measure of a truck's value is its ability to transport maximum payloads—where you want them, when you want them—at minimum cost. Unless your trucks perform all of these functions, efficiently, reliably, they are not giving you full value for your money.

Marmon-Herrington All-Wheel-Drive Trucks do give you your full dollar's worth—because they never let you down. All-Wheel-Drive power and traction—front wheels pulling, rear wheels pushing—guarantee that Marmon-Herringtons will get you there and back—on time... regardless of weather or terrain—on the highway or off.

Throughout, Marmon-Herrington All-Wheel-Drive Trucks are built in proportion to their great power and traction. Frames, axles, springs, transmissions—they're all built super-strong to take peak payloads—without a whimper... and do it for years and years and years.

Yes, Marmon-Herrington All-Wheel-Drive Trucks are built big for big jobs. For a convincing demonstration that these great trucks live up to their reputation—both the Heavy-Duty models and All-Wheel-Drive converted Fords—see your nearest Marmon-Herrington dealer, or write for illustrated literature.

MARMON-HERRINGTON COMPANY, INC. • INDIANAPOLIS 7, INDIANA

**MARMON-HERRINGTON**

**ALL-WHEEL-DRIVE**

# Tar and Gravel Make Good Secondary Road

## Placed on Well Rolled Gravel Sub-Base; Surface Course Mulched With Wire Mesh and Broom Drags

♦ A 3.1-MILE section of a Connecticut secondary highway has just been reconstructed in the town of Woodstock in the northeast corner of the state. Gravel was used as a sub-base in all cut sections, and gravel surface-treated with tar and sand as a surface course. The road is known as Black Pond Road; it connects State Route 91 at Woodstock Valley on the south, and the Woodstock-Union Road on the north. The original road was only 12 feet wide, a typical dirt road with little attention given to grades or alignment. The contract for the 16,307-foot improvement was awarded to Campanella & Cardi Construction Co. of Providence, R. I., by the Connecticut State Highway Department. The job included the elimination of sharp curves; better vertical sight distances; and a surface-treated pavement 18 feet wide with 4-foot gravel-surface-treated shoulders.

Grading started last November and continued until the middle of January when the weather forced a suspension of activity until the latter part of March. The drainage structures and grading were completed by the middle of May. The road is well drained, with 1,676 linear feet of reinforced-concrete pipe ranging in size from 15 to 72-inch diameter. This was purchased from and delivered by the Lock Joint Pipe Co. of West Hartford, Conn. The largest structures were two twin 72-inch culverts. One is 68 feet long and the other consists of a 36-foot extension to an existing culvert of the same size. The job also had one twin 60-inch pipe culvert 44 feet long. Pipe trenches were excavated either by a Lorain 1/2-yard Backdigger or a Lorain Moto-Crane with a 40-foot boom and a 3/4-yard clamshell bucket. The crane was also used in handling the pipe.

The small yardage of rock in the excavation was composed chiefly of boulders. It was removed by a single jackhammer powered by a Schramm 105-cfm portable air compressor. As the roadway fills were designed somewhat high, the job became borrow in nature, with over 22,000 yards required in addition to the 30,175 yards of excavation. The additional material was obtained from three borrow pits. One at the south end of the project furnished most of the required yardage, while the remainder came from two other pits near the north end. On both excavation and borrow the hauls averaged less than 1/2 mile.

The pits were worked by two Lorain

77 1 1/2-yard shovels, which kept from 10 to 12 trucks busy on the haul. With the exception of 3 contractor-owned trucks, the hauling was done with trucks rented by the hour: 3 Dodges, 3 Whites, 1 Autocar, and the remainder Fords. The units averaged from 3 1/2 to 4-yard capacity. The dirt was spread by three Caterpillar tractor-dozers, two D7's and a D4. Part of the roadway excavation was handled by a LeTourneau 8-yard scraper pulled by a D7 tractor.

### Gravel Sub-Base

In cut sections, 8-inch gravel sub-base was designed. But due to the character of the soil, it was laid 8 to 12 inches deep, depending upon the nature of the material encountered in the excavation. As the material from the bor-



C. & E. M. Photo  
▲ Buckeye 10-foot spreader box places sand cover at the rate of 20 pounds per square yard over an application of ET-3 tar on a Connecticut secondary road.

row pits placed on the fills was of a good granular quality, the special sub-base treatment was not necessary on fill locations. Gravel banks within a 6 1/2-mile average haul from the job

(Continued on next page)

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Series 80  
**PORTABLE AIR COMPRESSORS**

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3101-27 W. Grand Avenue, Chicago 22, Ill.

## Tar and Gravel Make Good Secondary Road

(Continued from preceding page)

were stripped and worked by the contractor with the same excavating and hauling equipment used on the earth work. Most of the gravel for sub-base came from a pit near the town of Eastford, on Route 91 near the south end of the contract. It was spread to a width of 26 feet extending out to the ditch line.

From 800 to 1,000 yards of sub-base gravel was laid in the 9-hour work day. As the material was spread in layers, all pieces of gravel over 5 inches in size were removed by hand and thrown off the roadway. The gravel remaining conformed to the following gradation requirements:

Sieve Size	Per Cent Passing
5-inch	100
5 $\frac{1}{2}$ -inch	30-60
No. 40	5-25
No. 100	0-10

The sub-base was then leveled off by an Adams No. 511 power grader and rolled continuously by two new Buffalo-Springfield rollers until it had been firmly consolidated at the proper grade.

### Gravel Surface Course

After the subgrade was consolidated and leveled off, two 4-inch courses of bank gravel were then spread—each course being watered and rolled in the process. While most of this top gravel was taken from near the pit supplying the sub-base material, the adjacent bank was much finer in texture and met the following screen analysis:

Sieve Size	Per Cent Passing
3 $\frac{1}{2}$ -inch	100
3 $\frac{1}{2}$ -inch	30-60
No. 40	5-25
No. 100	0-10

This surface gravel extended the full 26-foot roadway width since the 4-foot shoulders were also to be surface-treated. On top of this upper course, a penetration application of RT-3 tar, 0.6 gallon to the square yard, was then made at a temperature of 130 degrees F. Tar was purchased from the Newark, N. J., plant of the Reilly Tar & Chemical Corp. It was shipped in tank cars to Putnam, Conn., via the Central Railroad of N. J. and the New Haven RR, a distance of about 200 miles. The bituminous material was applied by the G. A. Winter Co. of Providence, R. I., with two Kinney distributors, a 2,400-gallon unit mounted on a Mack truck and a 1,730-gallon tank on a White truck.

The pumps on the distributors were used for transferring the tar from the tank cars to the distributors themselves, and on the 10-mile haul to the job the burners were lit to bring the tar to the temperature required. A 13-foot spray bar was used in order to apply half the roadway width at a time. The usual procedure was to empty half of the tank on one side of the road and then turn the machine around, come back, and spray the other half. At intersections, curved segments were usually sprayed by hand with a single nozzle connected to the distributor by a 20-foot length of hose. When detours were available, the road was closed off after the tar had been applied to permit several hours of penetration. A cover coat of sand was spread when the desired penetration was obtained. Otherwise, when the demands of traffic required the immediate use of the road, the sand was spread directly after the tarring operations.

About 20 pounds to the square yard or 0.2 cubic foot of sand was spread over the tar through a Buckeye 10-foot spreader box. Fastened at the rear of the sand trucks, the box was pushed



C. & E. M. Photo  
At an irregular-shaped intersection, RT-3 is applied by a hand nozzle on a 20-foot hose from a 1,730-gallon Kinney distributor on a White truck.

over the road on four rubber-tired sand from the trucks. The sand was wheels as two men kept it filled with purchased from a commercial plant at

North Windham, Conn., 17 miles from the job, and was graded in accordance with the following specifications; as follows:

Sieve Size	Per Cent Passing
3 $\frac{1}{2}$ -inch	100
No. 4	95-100
No. 50	10-25
No. 100	0-5

### Surface Mulch

The 10-foot spreader box made three trips over the road, distributing the sand cover in two 10-foot lanes and one 6-foot lane theoretically. The last strip was usually wider to permit overlapping and to make sure that all the tar was covered. Then a section of woven-wire fence, 8 feet wide x 14 feet long, was pulled over the tar-and-sand surface course, making a mulch of the two materials as well as throwing off to the side of the road any small stones that might have been present. Further mixing was done with a broom drag. It was fashioned from 2 x 8's into a framework 6 feet wide x 12 feet long, with 6-inch

(Concluded on next page)

*A complete line of*

# Pacific

## jaw crushers



Other Pacific Products include: Slushing Scrapers  
• Sheave Blocks • Rock Bit Grinders • Manganese Steel  
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C. & E. M. Photo  
An 8 x 14-foot section of woven-wire fence pulled by a Diamond T grease-rig truck was used as a drag to mix the tar and sand into a mulch.

## Tar and Gravel Make Good Secondary Road

(Continued from preceding page)

steel bristles secured to the frame so as to form the letter Z. This wire-mesh and broom dragging leveled off any irregularities in the surface, gave the road a smooth appearance, and also helped to maintain the  $\frac{1}{4}$ -inch-per-foot crown in the pavement.

Traffic was permitted on this surface for about a week. Then the roadway was given a second application of RT-3 tar, this time at the rate of 0.4 gallon to the square yard. This application was covered by about the same amount of sand and was followed by the dragging operations. Both drags were pulled by the same truck, a Diamond T which was fitted out as a grease rig. It carried a Graco Convoy Luber with four reels and hose for air, hypoid lubricant, chassis lubricant, and gear lubricant respectively. Texaco products were used on the job both for fuel and lubrication. A truck-mounted Hobart 300-amp electric welder was another useful piece of maintenance equipment.

### Quantities and Personnel

A force of 45 to 50 men was employed at the peak of operations. About 600 yards of top gravel was laid daily, while during the tarring from 10,000 to 15,000 square yards of roadway was covered with bituminous material in the 9-hour work day. The major items listed in the \$100,000 contract which was completed at the beginning of August were:

Earth excavation	30,175 cu. yds.
Rock excavation	2,790 cu. yds.
Trench excavation	1,640 cu. yds.
Borrow material	22,262 cu. yds.
Gravel, shoulders and sub-base	9,685 cu. yds.
Rolled bank-gravel surface	7,900 cu. yds.
Tar	51,750 gals.
Reinforced-concrete pipe, 15 to 72-inch	1,676 lin. ft.

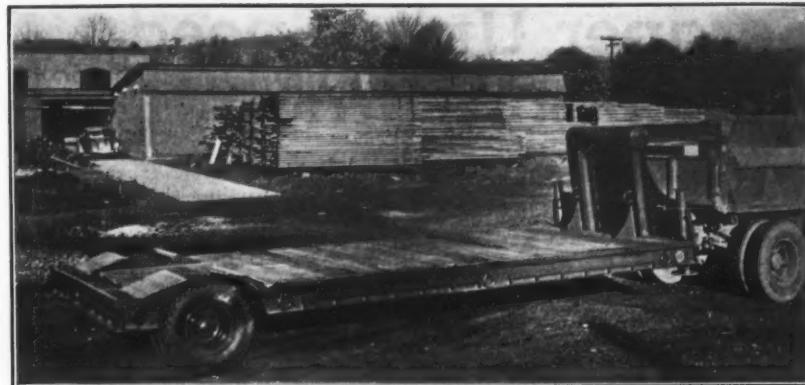
Harry M. Sampson was Superintendent for Campanella & Cardi Construction Co. Marcus Garrison was Inspector for the Connecticut State Highway Department on the project, which is located in the residency of W. T. Schuler, Resident Engineer with headquarters at Danielson. The Department is headed by William J. Cox, Commissioner, with Arthur W. Bushell, Deputy Commis-

sioner and Chief Engineer. Leslie G. Sumner is Director of Engineering and Construction.

### Ordinary Dump Truck Can Pull Heavy Trailer

An 11-ton flat-bed trailer, built by the Mead Machine & Iron Works, features a "fifth wheel" as an integral part of its construction. Described by one of the Lincoln Electric Co.'s field welding engineers, the Mead trailer needs no tractor unit to haul it. Its fifth wheel is so arranged that it can be suspended and mounted with ease in the bed of any standard dump-truck body. The unit is said to have high maneuverability as a result.

The trailer weighs 7,745 pounds, is 30 feet long, and has an 8-foot-wide platform. Main members consist of 8 x 8-inch H-beams welded to outside members consisting of 8-inch channels. Skid rails are welded to the top section, sides, and rear, with bull rings fused to the



An unusual "fifth wheel" mounted in the truck body is a feature of a new equipment trailer, making it possible for a standard dump truck to be used as the hauling unit.

frame for securing loads.

The front-end mounting structure is constructed of H-beams and tubular members, with welding of both the intermittent and continuous types used at the joints. General-purpose shielded-arc electrodes for mild steel are used.

The trailer platform has a deck

height of 29 inches, and a ground clearance of 20 inches. The flooring is of air-dried oak, and the unit is equipped with lights to meet all local and interstate regulations.

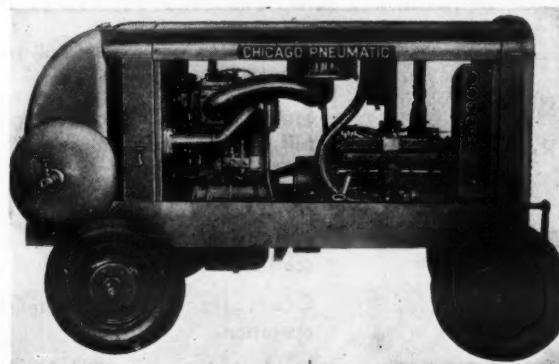
The Mead Machine & Iron Works, Inc., Warren, Pa., will be glad to give you further details on this trailer.

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**OUTSTANDING IN ITS WEIGHT CLASS** — The CP-42 Sinker Drill has penetrating power, excellent hole-cleaning, strong rotation. This fast 56 pound drill is ideal for general excavation, shaft sinking, quarrying, etc. CP Sinker Drills range from the 28-pound CP-22 to the 119-pound CP-60N.



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Whatever his requirements, the contractor always can rely on the CP line of air compressors, pneumatic tools, rock drills, electric tools, and other contracting equipment.

Developed to give efficient service under operating conditions of any nature, CP equipment is notable for practical design, excellent performance, low operating cost, long service, and minimum maintenance.

Furthermore, no user of CP tools in the United States is more than twenty-four hours from CP parts and CP service.

Write for a copy of Catalog 600, describing and illustrating the complete line of CP equipment for contractors.



**SMOOTH OPERATION — MINIMUM KICK-BACK** — The 55-pound CP-115 general utility DEMOLITION TOOL excels in its weight class for ease of handling — speed and efficiency of operation — low air consumption. The goose-neck air-inlet swivel is positioned so the hose cannot interfere with operator's hand.



**FAST AND ECONOMICAL TO OPERATE** — For concretes 3" slump and over, walls and columns under 15" thick, light floor and roof slabs, the CP-219 PNEUMATIC VIBRATOR is ideal, because of its high frequency, low air consumption, accessibility of parts and its economical, one-man operation.



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# Scraper Units Speed Airport Grading Job

**Fleet of Self-Propelled And Tractor-Drawn Units Operates Smoothly; Moves 333,000 Yards in 3 Months**

THE combination of an adequate fleet of well-chosen earth-moving equipment and easily handled dirt resulted in a fast grading job this spring at Frederick City, Md., Airport. This new airport is small but strategically located about 40 miles west of both Washington and Baltimore. It will give an added factor of safety to air travel, for often when bad flying weather prevails along the coast, conditions a few miles inland are quite different. Thus planes which may be unable to land at great metropolitan ports would, in many cases, find better weather only a few minutes flying time inland. The new facilities at Frederick will be a welcome haven in such emergencies.

The need for an airport in this locality gained recognition during the war. As a result, Frederick had the distinction of being one of the few cities in the country to receive special authorization from Congress during that time to construct a civil airport. However, the City encountered difficulties in purchasing the necessary land for the site, which lies about 2 miles east of the city and north of U. S. 40, the Baltimore Turnpike. It is high-value fertile farming land in this locality. The earth is a gravelly clay

covered with a layer of heavy topsoil 10 to 18 inches thick. This explains why a price of \$175 an acre had to be paid for the site. No clearing was required of the gently rolling land, which was wheat fields for the most part.

The Civil Aeronautics Administration designed and supervised the construction of the three-runway airport laid out in the form of a triangle. Two grading and drainage contracts were awarded to the Grandview Construction Co. of Mount Vernon, N. Y., which started work on March 25 and finished by the middle of June. The first contract involved 267,000 yards of excavation. It covered the grading of the longest runway, the north-south 5,000-foot No. 3, and the triangular area to the east where the other two runways were designed to go. Later, when additional funds became available, another contract for 66,000 yards of excavation was awarded to grade the two shorter runways, each 2,000 feet long. Runway 1 lies northeast-southwest, and runway 2 lies northwest-southeast. The design calls for ultimate lengthening of these two runways.

#### Runway Grading

The three runways are 500 feet wide between ditch lines. They are graded so that the sides slope away from the center line on a 1 per cent grade for the first 75 feet on each side, and on a 1½ per cent grade for the remaining 175 feet. Future runway paving will be



C. & E. M. Photo

Among the dirt-moving fleet used by the Grandview Construction Co. on its airport grading contract were four Super C 12-yard Tournapulls. Used for hauls averaging 1,500 feet, they were assisted in loading by Caterpillar D7's or D8's.

on the 150-foot center strip flanked by the 175-foot shoulders on each side. Most of the drainage is carried by the 2-foot-wide ditches, averaging 2½ feet in depth, at the sides of the shoulders. The cut slopes are 1 on 7 while the fill slopes are 1 on 2. To prevent erosion

on the fill slopes from water coursing off the runways, 2-foot-high x 3-foot-wide berms were banked along the edge of the fills. Sod gutters at the sides of these berms carry the water along to designated outlets, where other sod

(Continued on next page)



**CLEVELANDS**

**FOR ASSURED...DEPENDABLE TRENCHING PERFORMANCE AT MINIMUM OPERATING AND MAINTENANCE COST ON LONG AND SHORT LINES FOR WATER... SEWER...GAS...TELEPHONE...OIL...POWER...DRAINAGE...FOUNDATIONS...AIRPORTS**

Incorporating the engineering features that more than 25 years experience have proved most desirable CLEVELANDS have everything you'd ask for, for "Tops" in trenching performance.

They're fast — amply powered — maneuverable — mobile — versatile — easy to operate — sturdily constructed — in fact they have just those features that enable you to make short work of the trenching jobs and show a profit.

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Built small for ECONOMY, the NEW Galion No. 402 Light Weight Motor Grader is plenty rugged. It has both the power and blade pressure to give you top performance under all ordinary grading conditions.

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LIGHTWEIGHT  
THAT CAN  
REALLY  
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**GALION**  
IRON WORKS  
GRADERS • ROLLERS

## Scraper Units Speed Airport Grading Job

(Continued from preceding page)

gutters run down the slopes to the toe of the fills.

Runway 3 drains northwards to the Monocacy River by way of the ditches. But along the east side near the north end 520 feet of 42-inch sealed-joint concrete pipe was laid to drain the lowest point on the field. The only other pipe that was required was a 524-foot line of 27-inch sealed-joint concrete pipe laid across the south end of runway 3. A Bay City  $\frac{3}{4}$ -yard trench hoe dug the pipe trench and also set the 4-foot lengths in place where they were sealed with mortar.

On the earth work, cut and fill quantities balanced. The contractor used four Super C 12-yard Tournapulls for hauls averaging 1,500 feet, and tractor-drawn scrapers for the shorter hauls averaging 350 feet. The latter units were made up of LeTourneau scrapers pulled by Caterpillar tractors in the following combinations:

- 2 Model W 25-yard scrapers with D8 tractors
- 2 Model FP 12-yard scrapers with D8 tractors
- 1 Model F 18-yard scraper with D8 tractor
- 2 Model LP 12-yard scrapers with D7 tractors
- 1 Model YP 10-yard scraper with D7 tractor

With this equipment an average of 7,000 yards of earth was moved in a  $\frac{1}{2}$ -hour day. About one-third of the work was done by the self-propelled scrapers. The remaining two-thirds was handled by the tractor-drawn scrapers. The first contract was let March 25. During the month of April the contractor was favored with exceptional weather—in fact, a 50-year record for dryness. He had to lose only one working day because of rain. Breakdowns were few; those that did occur were caused by the poor quality of wire rope that was obtained from war-surplus stocks, the only source of material available at the time. The scrapers practically always carried capacity loads in the easily dug soil, and excellent progress was made over the short hauls.

Four tractor-dozers, two D8's and two D7's, were available as pushers in loading or to spread the fill in the required 8-inch layers. The Tournapulls usually traveled at such a fast speed that they unloaded in 4-inch layers. This was all to the good in the matter of compaction. The clay in the soil retained its natural moisture to a considerable degree so that no water had to be added for the fills. Although a sheepfoot roller was available on the job, it did not have to be used. The heavy earth-moving equipment compacted the thin layers to the required density. Final shaping of the grade was done by a Caterpillar No. 12 power grader.

The second contract was let on May 1 and both contracts proceeded simultaneously with the same equipment. They were finished June 13, two weeks beyond the contract time, with a 36-year record of rainfall for the month of May.

### Equipment Maintenance

Most of the equipment for this job came from a previous grading contract recently finished by the Grandview Construction Co. at the Cumberland, Md., airport. The tractors were either shipped to Frederick on flat cars via the B & O railroad, or hauled in on truck trailers. The scrapers, riding on rubber tires, were towed to the job by some bottom-dump Euclids that are part of the contractor's equipment. The Tournapulls made the 90-mile trip under their own power.

Because of the comparatively small size of the job and the fact that the equipment was thoroughly overhauled before being sent to Frederick, not

much in the way of maintenance machinery was needed at the airport. A 30 x 20-foot three-sided wooden shed was built in which minor repairs were handled. Across the back of this shed was a wooden workbench equipped with a vise, several electric outlets, and

a Walker-Turner bench grinder. Welding was usually done in the open either by a G-E 300-amp electric welding outfit or an oxyacetylene set, both of which were mounted on an International truck. On a similar truck a wooden van was mounted which fur-

nished the replacement parts for tractors as needed.

Fuel, oils, and greases were supplied by the Standard Oil Co. of New Jersey and were trucked out from Frederick in the oil company's trucks. Fuel oil

(Concluded on next page)



### ...keeps Heil Hydraulic Bulldozers on the job doing more Low-cost Work for You

Because Heil hydraulic Bulldozers move more dirt at less cost, they are general favorites with Oliver-Cletrac users everywhere. These contractors like the quick, accurate blade control; the full visibility; and the fast digging action made possible by the Heil hydraulic system. They know that the scientific contour of the Heil Bulldozer blade, with its reversible cutting edge, gives a bigger load-carrying capacity than you get with conventional units.

All these things result in more work done, but that isn't all. There is one more feature of tremendous importance — dependable strength. The trouble-free hydraulic system, for example, is practically leak-proof. Large diameter cylinders permit the use of low

hydraulic operating pressures. Piston rods are chrome-plated to prevent rusting and pitting. The tolerance between the piston and its finely honed cylinder is so close that there is seldom, if ever, any need for time-consuming piston replacement.

Heil's all-welded box-section construction provides unusual strength; there is no dead weight to slow down the work. Tailor-made for Oliver-Cletrac tractors, the Heil hydraulic Bulldozer is attached by means of sturdy connections in such a way that there is proper distribution of loads and stresses. That is why Heil hydraulic Bulldozers stay on the job — turning out low-cost work. See your nearest Oliver-Cletrac distributor for further important details.

You get something for nothing when you use Heil Cable Scrapers — bigger loads. The Heil bowl design permits loading 15% more material in the same length of time and with the same drawbar horsepower as conventional units. Nothing can touch a Heil Cable Scraper for yardage.

R-83

**THE HEIL CO.**

GENERAL OFFICES, MILWAUKEE, WISCONSIN

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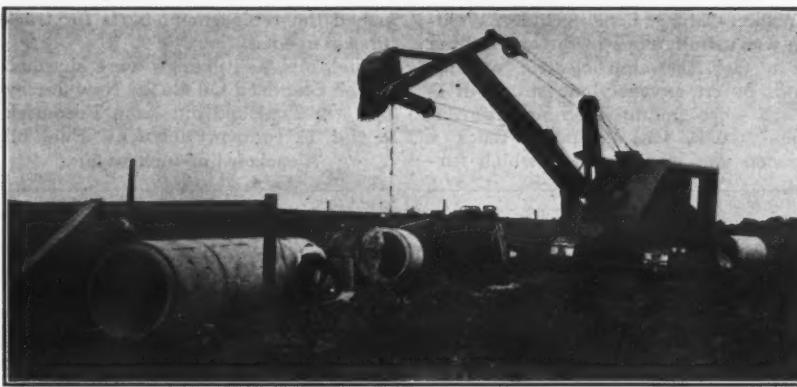


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**MARTIN MACHINE COMPANY**  
KEWANEE, ILLINOIS

**MARTIN CARRYHAUL TRAILERS**  
"Make Hauling A Pleasure!"

Ease of loading, dependability and economical operation are three Martin CARRYHAUL Trailer characteristics which make them the leaders in the field. Regardless of your hauling job, there's a proper size Martin CARRYHAUL Trailer to do it for you safely and economically.



C. & E. M. Photo  
Drainage for the Frederick City, Md., Airport was included in the Grandview contract. Here a Bay City trench hoe, which dug the trench, places 42-inch concrete drainage pipe along the east side of Runway 3.

## Scraper Units Speed Airport Grading Job

(Continued from preceding page)

was stored in an underground 30-barrel-capacity tank. Equipment was greased daily at a portable service station mounted on an International truck. This station consisted of four reels with 50-foot hose for air, motor oil, chassis, and gear lubricant operated from a small air compressor. Alemite hand

grease guns were also part of the equipment. A city water main reached to the edge of the field where a hydrant was tapped for drinking water and equipment use.

### Quantities and Personnel

The combined quantities for the two contracts totaling \$124,556.75 included the following major items:

Excavation	333,000 cu. yds.
Concrete pipe, 42-inch	\$20 lin. ft.
Concrete pipe, 27-inch	\$24 lin. ft.
Sod for berm and gutter	2,300 sq. yds.

The Grandview Construction Co. employed a force averaging 30 men under the direction of Superintendent Arnold Cribari. For the Civil Aeronautics Administration, Warwick C. Thomas was Resident Engineer. The Regional Administrator of the CAA in this area is O. W. Young, and R. M. Brown is Superintendent, Plant and Structures Branch.

### Shop Tools

A varied line of products for the highway or contractor's shop is presented by Ideal Industries, Inc., in a 24-page catalog just issued. Among the items shown are etchers for marking tools, dust collectors, electric tachometers, grinding-wheel dressers, chucks, lathe accessories, and such pneumatic tools as drills, screw drivers, hammers, and rotary file and die grinders. Write the firm at 1296 Park Ave., Sycamore, Ill., for copies of this illustrated booklet, Form MTC-1245. Say you saw this notice.

### AH&D General Catalog

The first complete catalog of its products has been issued by the American Hoist & Derrick Co., St. Paul 1, Minn. It is available to readers of CONTRACTORS AND ENGINEERS MONTHLY on request. Products listed include Crosby wire-rope clips, blocks and sheaves, the Handiwinch, car pullers, hoists, steel derricks, material elevators, locomotive cranes, ditchers, pile drivers, revolving cranes, and marine deck machinery.

### Winter Concrete Mixing

Heating units for use with concrete mixers and pavers during winter weather are featured by Littleford Bros., Inc., in a 6-page catalog. The firm makes heaters for both the mixer and the mixing water. It makes two types of concrete heaters: the torch-burner type, and the low-pressure burner type. Write Littleford Bros., Inc., at 485 E. Pearl St., Cincinnati 2, Ohio, and ask for Bulletin S-11.

When specifications call for surface vibration immediately following a spreader, don't forget that your JACKSON Vibratory Paving Tube can be quickly and inexpensively changed to fully meet those requirements. All that's necessary is to substitute the two vibratory units shown in the illustration, for the vibratory tube and attach to the rear of the spreader by means of the hinged connections. Each vibratory unit is equipped with one or more vibratory motors of 3600-4200 frequency, is independently suspended and adjustable for crown and working height. Widths can be furnished to suit job. Width changes can be easily made by use of inserts. Thus the JACKSON becomes double functioning and eliminates the necessity of buying an extra machine. See your JACKSON distributor or write for further information.

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# Road Improvement Includes Removal of Kinks for Safety

## Old Highway Is Widened, Rebuilt and Hard-Surfaced For 6.025-Mile Stretch; 235,000 Yards Moved

THROUGH the red clay of Alabama's cotton, corn, and cattle country, scrapers moved 235,000 cubic yards of dirt on a recent project. The job provided stabilized subgrade for 6.025 miles of single bituminous surface treatment along the reconstructed Selma-Sprott highway, State Route 43. The old winding and narrow highway is being unbent and widened, and the original gravel surfacing replaced with asphalt. These improvements will enable it to meet the heavy demands of private and commercial traffic on this popular route between Tuscaloosa, Selma, and Montgomery.

Although State Route 43 was pounded day and night by the tires of thousands of trucks, buses, and passenger cars, it fell far below the standards of modern roadways. It had a 24-foot shoulder-to-shoulder width and a scant wearing course of gravel. Several curves along the old highway were dangerous, and several bridges provided passage in only one direction at a time.

Much of the reconstruction of the road lies along the line of the old highway and consists merely of widening. But two of the worst curves along the 6 miles of reconstruction are being eliminated in 5,100 feet of completely new grade. The rebuilt road will offer the motorist safe and adequate sight distance at all times. It will also measure up to present highway standards with a 34-foot finished roadbed and 22-foot bituminous wearing course flanked on either side by 6-foot shoulders.

The contract for this work in Dallas County, Project F-311 (1), was awarded by the Alabama Highway Department to the Wright Contracting Co. of Columbus, Ga., on its bid of \$227,758. This firm found itself swamped with dirt work. So it almost immediately rented from the Ziegler Construction Co. of Nashville, Tenn., the equipment and supervision for all grading, drain-

age, and single bituminous surface treatment. Ziegler started moving dirt on March 20. A separate contract for bridges along this same section of highway was awarded Goodwyn-Murphree of Troy, Ala., on a bid of \$148,793. Work on the structures started early this summer.

### Roadway Preparation

Brush and trees crowded the narrow old road right up to the very shoulders. Initial preparation of the roadbed for its bituminous surface treatment included 108.9 acres of light to heavy clearing and grubbing. A foreman and



C. & E. M. Photo  
Fill for the stabilized subgrade was compacted in 9-inch lifts by Blaw-Knox sheepfoot rollers pulled by Caterpillar D4's.

clearing crew of 12 men, using hand tools, removed all growth with the exception of heavy timber located within the construction line. This was sawed by hand and then dozed or snaked out by an International TD-18 tractor or a Caterpillar D8 for burning or other disposal.

Roadside development was not in-

cluded as a specific item in this highway reconstruction project. But the Project Engineer for the Alabama Highway Department, R. C. Vines of Selma, found it possible to effect some measure of future erosion control and roadside improvement by working very closely with the clearing and grubbing crews

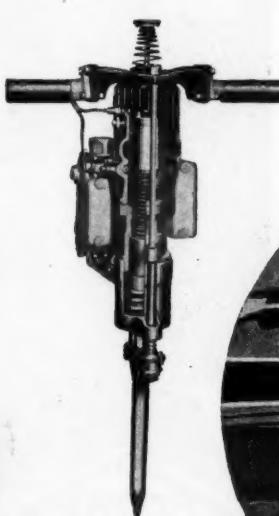
(Continued on next page)



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## Road Improvement Realigns for Safety

(Continued from preceding page)

and later with the construction crews. When Mr. Vines drew his highway sections, he spotted all fair-sized trees within the 120-foot right-of-way which were outside the actual construction line. These trees were daubed with white paint to save them from the grubber's axe.

"It's not roadside development in the strict sense of the words," commented the Project Engineer, "but I think the traveler will be grateful for the shade. And when the heavy spring rains come, year after year, the tangled roots are going to do a lot to keep the soil in place."

### Moving Dirt

As the first clearing was completed, Superintendent A. N. Barber brought in his prime dirt movers—3 Caterpillar DW10's with 10-yard LaPlant-Cheate scrapers and 2 Caterpillar D8's with 15-yard LaPlant-Cheate scrapers. Off to a slow start because of heavy rains and wet borrow areas that bogged down the tractors, the contractor moved 50,000 cubic yards of sandy clay between March 20 and May 7. During this period, 11 days when no equipment turned a wheel were complete losses.

By the middle of May, however, although the dirt was in far from an ideal condition, operations had been stepped up to an average production of 3,000 cubic yards in a 10-hour day.

Excavation came from cuts with not too well balanced fills—there were 166,000 yard-units of overhaul excavation on the project—and from side borrow. The largest borrow area on the entire job was located near the middle of the project. There the scrapers removed 90,000 cubic yards of dirt from a borrow section extending along the highway for 1,000 feet and back from the center line of the highway for 280 feet on either side.

### Hauls and Fills

Hauls over the job were fairly long. Considering the project from the viewpoint of total yardage, the average scraper haul was 800 feet. At one fill in an old creek bed, 85,000 cubic yards of unclassified material was used as fill. The scraper haul here was a long grind,



C. & E. M. Photo

Ziegler used a mobile lubricating outfit to handle greasing on this job. The grease monkey is giving a Caterpillar DW10 tractor "the works" with D-A lubricants.

running from 1,500 feet to 1,800 feet.

Cuts were not particularly large. There were four of them on the job with excavation averaging between 6,000 and 7,000 cubic yards. One of the largest cuts was 1,500 feet long at an average depth of 4½ feet and containing 15,000 cubic yards of dirt.

In both the cuts and in the side-borrow areas, the Caterpillar DW10 trac-

tors with their 10-yard LaPlant-Cheate scrapers and the Caterpillar D8 tractors with their 15-yard LaPlant-Cheate scrapers were assisted in loading by pusher-tractors. This important service was rendered by a Caterpillar D8 and an International TD-18.

### Spreading and Compacting

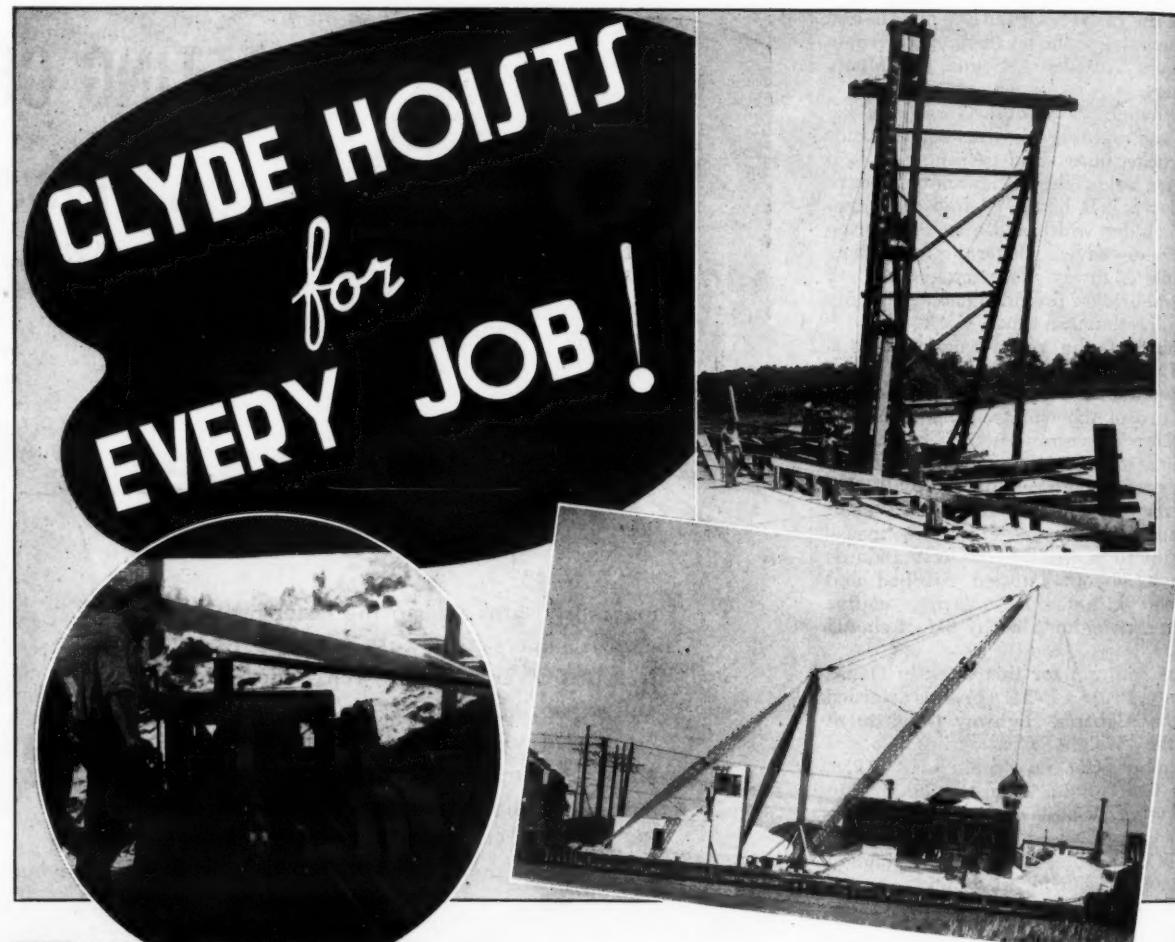
The fill for the subgrade was spread

in maximum 8-inch lifts by the scrapers. It was compacted to 95 per cent (AASHO density) by two Caterpillar D4 tractors with Blaw-Knox tandem sheepfoot rollers. Some 40,000 cubic yards of pit-run gravel was spread in two lifts of 4 inches each for the base course and compacted to 100 per cent density by the sheepfoot rollers. Also compacted to 100 per cent density was 42,000 cubic yards of roadbed topping material consisting of pit-run sand-clay with about 12 per cent clay. An Insey ¾-yard dragline was used at the gravel and at the sand-clay borrow pits which were located between 3 and 4 miles off the highway near the middle of the project.

### The Finished Roadway

The completed highway, as contrasted with the old gravel-surfaced road with its 24-foot shoulder-to-shoulder width, will have a shoulder-to-shoulder width of 34 feet. The first 4 inches of base course extends the full width of the

(Concluded on next page)



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## Road Improvement Realigns for Safety

(Continued from preceding page)

roadway. The second 4-inch lift extends for a width of 24 feet with a 5-foot shoulder of loamy topsoil. Forward slopes on the reconstructed highway are 4 to 1, the ditch has a minimum bottom width of 5 feet, and backslopes are 4 to 1.

Single bituminous treatment, 22 feet wide over the new grade, will require 82,000 square yards of bituminous plant-mix seal, Type F-1, applied at 60 pounds per square yard. Surfacing was scheduled to start late this summer.

### Care of Equipment

The Ziegler Construction Co. had lots of dirt to move this year, on this project

and on other jobs scattered throughout the south. Until new equipment becomes more generally available, the old machines are spread rather thinly over a tremendous yardage of dirt. Like many another contractor, Ziegler realizes the importance of keeping the equipment moving the pay dirt, so preventive maintenance is the order of the day.

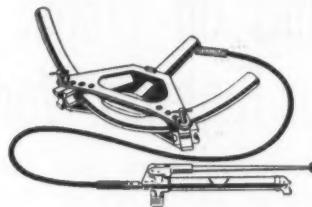
One of the elementary considerations that can be given any piece of highway equipment on any job, anywhere, is lubricating and greasing. This construction company has taken an antiquated but not decrepit White truck and mounted a Continental-engine-driven compressor on the flatbed. Attached are pressure-greasing, lubricating, and air hose. These shoot D-A lubricants once during every 10-hour shift into the gears and wheels of every

piece of equipment on the project.

### Personnel

The Ziegler Construction Co. is working one 10-hour shift 6 days a week with a Superintendent, 3 foremen, 7 skilled, 4 intermediate-grade, and 23 unskilled employees on the payroll. A. N. Barber of Pell City, Ala., is Construction Superintendent for the contractor. The Project Engineer for the Alabama Highway Department is R. C. Vines of Selma. S. J. Cumming, Division Engineer, Tuscaloosa, Ala., has supervision of the work. Marvin Taylor is State Construction Engineer.

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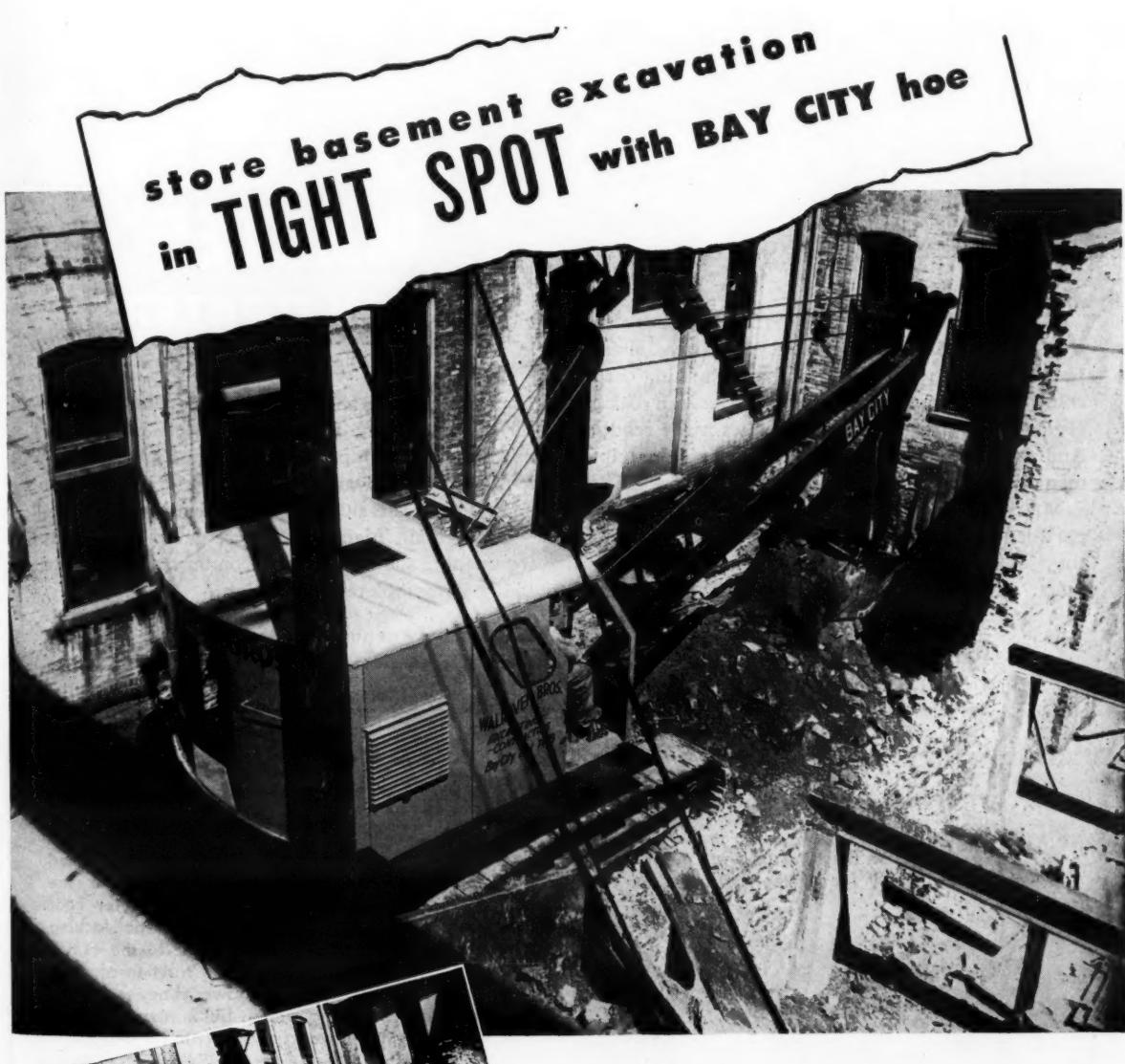
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# Rules on Wages For Highway Work

**Contractors May Not "Up" October 1942 Wage Rate Without WAB State-Wide Or Individual Approval**

By ARTHUR D. HILL, JR., Chairman, Wage Adjustment Board

Since Mr. Hill wrote this article on wages, the 1942 Stabilization Act has had some ups and downs. It expired July 1, then was extended on July 25. Contractors who altered wages in the interval must now revert to the approved wage rates which were in effect June 30, 1946. They must secure WAB approval before putting any other rates into effect.

However, they will not be subject to violation proceedings for wages paid from July 25 to August 10, on one condition: that they have filed application for approval of those wages with the WAB during that period. Only if they continue payment of unapproved rates after August 10 will they be subject to enforcement proceedings.

\* WAGE stabilization is an old story to most employers in the construction field. They recall that controls were set up in the spring of 1942 to keep construction wages within the general pattern of the wartime economy. Those wages were stabilized, roughly at the rates which were being paid October 3, 1942, to on-the-site construction workers.

Today those wage-stabilization controls remain in effect (as provided in Executive Order 9672, December 31, 1945, and in the National War Labor Board General Order 41, August 18, 1945, as amended). The authorization of any wage adjustments in the construction industry is vested in the Wage Adjustment Board, a tripartite body established in the Department of Labor on May 19, 1942.

This one Board administers the principles of stabilization that pertain both to highway and to other types of construction. But there are some technical differences between these types. The following remarks apply only to highway construction.

#### Applying for WAB Approval

No change in existing wage schedules, either up or down, may be made without the approval of this Board except that an employer engaged in non-Federal construction may, without further approval, pay the applicable area rate which may be established by the Board for the designated area. To repeat—highway contractors must have prior Wage Adjustment Board approval for any changes they want to make in the October 3, 1942, wage rates other than the adoption of area rates authorized by the Board. Those who fail to secure such approval are in violation of the stabilization laws. They are subject to monetary penalties, including income-

tax disallowances by the Bureau of Internal Revenue.

Application forms on which to request approval of wage-rate changes may be obtained by writing to the Wage Adjustment Board, Department of Labor Building, Washington 25, D. C. When the applications are received in that office, they are assigned a number.

Then notices that the application is pending are transmitted to interested parties in the locality which will be affected by the adjustment. A case is presented to the Board when the two-weeks notice period has expired. The parties receive a formal decision which notifies them of the Board's final action.

During the early war period, the

Board had few occasions to consider the wage rates applicable to highway construction. The reason is obvious—high-priority defense construction precluded most large road jobs. At that time, reports from various state highway commissions indicated that road work was being limited to necessary repair

(Concluded on next page)



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## Rules on Wages

(Continued from preceding page)

and maintenance performed by state employees.

The unceasing flow of war goods and other materials over our highway systems caused serious deterioration, however. So as early as mid-wartime, many agencies laid plans for immediate post-war improvements. As an important first step in this large-scale highway-construction program, they asked the Wage Adjustment Board to approve schedules of wage rates for highway construction on a zonal basis throughout a number of states.

Unions and contractors jointly submitted most of these applications for zone schedules, on the basis of collectively bargained rates. In some instances state highway commissions, too, were active parties to the petitions. Appearing before the Board, they furnished valuable wage data from their own pay rolls—notably, wage rates existing on highway construction in their respective states on January 1, 1941, and on October 3, 1942; also, wage rates paid on force-account maintenance and repair work throughout the war period.

The Wage Adjustment Board's schedules were arrived at by weighting averages, by considering the authorized rates in building construction and industry, and by taking into account the differentials that were in force prior to stabilization. Experience has shown that these schedules were adequate to carry the highway-construction program forward. At the same time they reflected a pattern consistent with stabilization principles.

### State-Wide Wage Schedules

State highway commissions have sought a stabilized schedule of wage rates because doubt as to the legal rates for highway construction has kept contractors from submitting bids. Upon approval by the Wage Adjustment Board, such a schedule sets both maximum and minimum rates. These must be paid by all contractors performing such work in the area covered. Uncertainty is thus banished, and all contractors can compete for contracts and labor on a basis of absolute equality so far as wage rates are concerned.

The earliest state highway case considered by the Board was the Michigan

case, decided in October, 1944. Subsequently state highway schedules have been approved for Nebraska, Kansas, Iowa, Missouri, Tennessee, North Carolina, and South Carolina. The Board has also, of course, considered applications from individual contractors relating to one project or one locality. But it views the processing of state-wide cases as the most effective method of stabilizing highway rates.

The Board is concerned at the present time because applications for highway rates have not been submitted in greater numbers. It recalls the diversity of rates paid by individual contractors on highway work prior to stabilization. And it fears that in the present-day tight labor market, increases may have been made without Board authority in order to meet competitive employment conditions. It therefore seems wise to repeat still once more: no rates higher than the October 3, 1942, rates may be legally paid, unless a higher individual or state-wide schedule has been approved by the WAB. The October 3,

1942, date coincides with the issuance by the President of Executive Order 9250, which prohibited in all industries any wage and price increases without Federal sanction.

### WAB Powers, Policy, Purpose

The Wage Adjustment Board urges highway contractors to keep on seeking approval of rates they want to use, and to be circumspect about using any rate of doubtful validity. It does not have any enforcement powers in connection with violation of rates. But such authority is vested in the National Wage Stabilization Board. This agency succeeded the National War Labor Board, and is administered through regional offices. Questions pertaining to enforcement should, therefore, be taken up with the regional board in whose jurisdiction the project involved is located.

The Wage Adjustment Board tries to apply its standards in a practical manner, designed to encourage compliance with authorized schedules. The combined experience of the labor, industry,

and public members who compose the Board is called into play constantly in determining wage rates which are realistic, workable, and in keeping with stabilization aims.

The Board was organized to assist the construction program during the war expansion. Its life has been extended to assist in the transition of that industry to a peacetime basis. To that end, it hopes at all times to warrant cooperation and approval.

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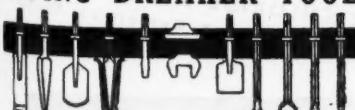
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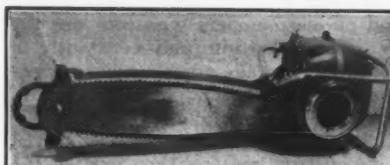
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The new Reed-Prentice power chain saw is available in a 20-inch model for one-man operation, and in 24 and 30-inch two-man models.

### Light Chain Saw Has Built-In Engine

A power chain saw in three sizes has been announced by the Reed-Prentice Corp. Driven by a gasoline engine, the unit is said to be very maneuverable, especially in the woods, since it does not depend on power lines or air compressors. A 20-inch cutting capacity is available in the one-man model, and 24 and 30-inch capacities for two-man operation.

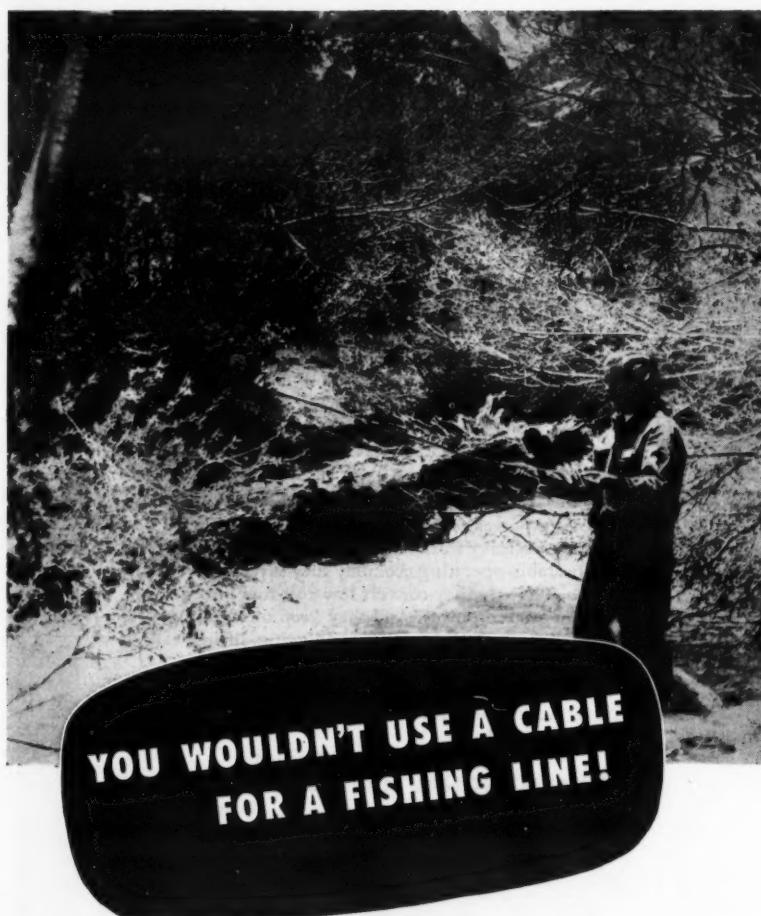
This self-contained saw makes use of aluminum or magnesium die castings to lessen its total weight. The 20-

inch unit weighs 52 pounds, the 24-inch model is 54 pounds, and the 30-inch saw, 57 pounds. The 4-hp engine has a positive fuel-injection system which enables the saw to operate at angles of 90 degrees or more without adjustment.

An automatic centrifugal clutch allows the engine to idle in the event of binding. It also makes for greater safety when the machine is not in operation. The oil and gasoline tanks are built into the engine shroud, both for protection and for better appearance. A newly designed chain-and-guide bar permits accurate setting and locking of the saw frame to provide proper tension on the chain, Reed-Prentice says.

Full details on this new Timberhog gasoline-driven chain saw can be obtained from the Timber Saw Division of the Reed-Prentice Corp., Worcester, Mass. Tell the firm you read this news report.

Accidents in construction are costly. Remember—safety always pays.



And it's unnecessary, too, to use heavy-wall pipe on jobs that can be handled by Naylor light-weight pipe.

This distinctive light-weight pipe has an exclusive Lockseam Spiralweld structure that provides greater strength, leak-tightness and safety than any other light-weight pipe and makes it ideal on applications in the construction field. Just consider advantages like these:

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### Paving-Material Data

The properties of Bitucote, used for paving highways, airports, driveways, and other areas, are discussed in a colorful brochure just issued by the Bitucote Products Co. The 8-page illustrated bulletin shows various ap-

plications of the emulsified-asphalt product in penetration, road-mix, plant-mix, surface treatment, and base stabilization. Copies can be obtained by writing the firm at 1411 Central Industrial Drive, St. Louis 10, Mo. Mention this notice in CONTRACTORS AND ENGINEERS MONTHLY.

## LACLEDE WELDED DOWEL SPACERS

### RIGID - ACCURATE

FOR CONTRACTORS, LACLEDE DOWEL SPACERS provide a light weight, economical method of placing dowels and joints. Distribution bars, supports, and dowel sleeves are all welded into one integral unit for rapid joint assembly. Shaped tie wires accurately locate fibre or steel joint materials.

FOR ENGINEERS, LACLEDE DOWEL SPACERS provide a rigid, accurate, prefabricated assembly for holding each end of each dowel in exact location. Both horizontal and vertical alignment of the dowels can be maintained on even the most irregular subgrades within limits prescribed by highway engineers.

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ARCADE BUILDING  
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Use Calcium Chloride  
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**Save Time**—When the temperature drops from 70° to 50°, it takes twice as long for normal concrete to acquire specified strength. By using 2 pounds of calcium chloride per bag of cement, concrete is back on normal strength-attaining schedule. At freezing temperatures, when covers and artificial heat also are necessary, calcium chloride reduces the time this protection is required.

**Save Forms**—Concrete placed at the average rate of two feet an hour requires 50% greater form strength when the temperature is 50°, due to the slowness of the concrete in hardening and acquiring strength to support succeeding placements. By using calcium chloride, concrete can be placed at 50° without additional form cost.

Substantial additional gains at all times come from better appearance, less voids, reduced crazing and smaller volume change with calcium chloride in the mix. Our booklet "Calcium Chloride in Concreting" is available on request.

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Better Concrete Faster  
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### Mobile Lab Tests Tires And Wheeled Equipment

The first showing and demonstration of a huge dynamometer truck designed by Goodyear Tire & Rubber Co. was conducted recently for engineers and officials of The Heil Co., Milwaukee. The truck's function is to test the range of large tires and wheeled equipment used in off-the-road service.

This traveling laboratory measures pulls imposed on it by either tractive effort or rolling resistance. It will be used to determine the effect of tire size, load, inflation, deflection, and speed on traction and rolling resistance. The

truck is also able to determine the average drawbar pull from tractors and other powered equipment, the additional drawbar pull of a tractor over that required to pull a wagon or scraper, and the horsepower delivered in different gears by powered vehicles.

Instruments mounted on the truck, which was modified from a 6-ton 6-wheeled Army vehicle, show the speeds over the range in which the work normally will be performed. They also measure the distance traveled and determine slippage. The test unit is big enough to be used with the largest off-the-road equipment.

First of its type in the industry, ac-

cording to Goodyear, this dynamometer test truck will be made available to manufacturers for equipment testing.

### Small Asphalt Plant

Asphaltic mixes in capacities up to 20 tons per hour can be obtained from the continuous-mix Patchmaster, says the Iowa Mfg. Co. in Bulletin PM-15M. The machine is supplied in portable or stationary models. It is particularly applicable to patching work or out-of-the-way jobs. The bulletin will be sent on mention of this notice. Write the Iowa Mfg. Co., 916 16th St., N.E., Cedar Rapids, Iowa.

### New Indiana Dealer

The Wabash Equipment & Supply Co. of Indianapolis has been appointed a distributor for the Davey Compressor Co. It will carry the Davey truck power take-offs, mobile machine shops, power saws, and portable and stationary compressors. The firm also has sales and service facilities for Wayne-Crane, Page Engineering Co., Pettibone Mulliken Corp., Shovel Supply Co., and Winslow Government Standard Scale Works. Founded recently by ex-serviceman R. W. Schwartz, Wabash has offices in the Test Building, and plans branches in other Indiana locations.

Bleak isn't it? In places like this you want proved equipment.....

....It doesn't matter where the blizzard hits—whether it's close to the barn or 40 miles from nowhere, if you are Snogo equipped you know your snow removal job is being done.

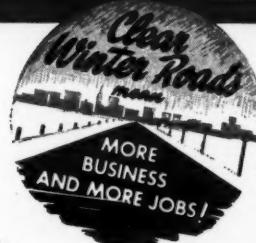
Behind Snogo is 19 years of service in the field. Snogo has been proved in every known snow condition. It is fast, thorough, dependable.

Snogo will slug its way hour after hour through blocked or drifted road. Snogo removes the snow completely, throwing it off the road, leaving the ditches

open to do the job they were built for.

Snogo cuts away the deep side as easily as the low side of the drift. The loss on broken or heaved up pavement due to uneven frost penetration is greatly reduced. There will be no hazardous one-way bottle necks with half the road blocked to the center line.

Snogo is the machine your department and your community can count on to be on the job when you want it for safer winter transportation.



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A SNOGO For  
EVERY BUDGET

# By-Pass Is Completed With Concrete Paving

## Material Shortages Delay Project Started in 1942; Section of Dual Highway For Joint-Spacing Tests

THE 4.1-mile Fredericksburg, Va., By-Pass, on which grading was started in 1942, was opened to traffic this July. Its completion had been delayed by shortages of material, chiefly steel, needed for the structures and for reinforcement in the dual concrete pavement. These war shortages were partly overcome on this new section of U. S. 1 by changing the superstructure design of the four bridges, three over water and one crossing State Route 3, from structural-steel I-beams to reinforced concrete. But even with this modification the necessary reinforcing steel was difficult to obtain.

The new by-pass begins at the Rappahannock River bridge which marks the north corporate limits of the town. It continues south to rejoin U. S. 1 at the intersection of State Route 51, 4 miles south of Fredericksburg, thereby eliminating a bottleneck which had long existed in the narrow streets of the historic city. Lying to the west of Fredericksburg, the improvement consists of two 24-foot highways. These are separated for about 3 miles at the south end by a 20-foot depressed median strip, and for the remaining distance at the north end by a raised 4-foot median strip with barrier-type curbs. The southbound lane was built according to standard Virginia Department of Highways practice, with expansion joints every 90 feet, and the intervening contraction joints at 30 feet. On the northbound lane, varied spacing of both kinds of joints was used, to see which spacings will prove the best, and to establish a yardstick for future concrete-paving construction.

E. W. Hechler Co. of Highland Springs, Va., was awarded the two contracts into which the project was divided. The first contract consisted of all the grading and structures together with the concrete paving on the southbound lane. The second contract included the curb construction and the

paving of the northbound lane. After the grading was completed, a 6-inch layer of granular material was spread as a subgrade foundation. The pavement has a uniform thickness of 9 inches and is mesh-reinforced throughout, with the exception of a 1,070-foot test section of plain concrete on the northbound side. The special subgrade material extends under the shoulders where it has a depth of 15 inches. Each 24-foot pavement has a center crown from which the pitch is  $\frac{1}{8}$  inch per foot to the 8-foot shoulders, which slope  $\frac{3}{4}$  inch to the foot towards the ditch line.

By the autumn of 1945 the contractor had completed the grading operations involving 23,355 cubic yards of earth work. He had also placed the subgrade granular material and paved the entire southbound lane. A conveniently located borrow pit, about midway of the project, furnished a good grade of sand-gravel for use as subgrade material. Excavation at the pit was done by a Lorain 55 1-yard shovel, which loaded six 1½-ton trucks for hauling the material to the roadbed. There it was spread by two Galion power graders and rolled by a Buffalo-Springfield 10-ton 3-wheel roller. The autumn of 1945 was mild in this part of the Old Dominion state. It enabled the contractor to begin paving operations on the northbound lane early in November and continue until November 21 when he was forced to suspend operations for the winter. Paving was resumed on March 21 of this year, and dry weather in the early spring brought a completion of the concreting by April 16. About two more months were necessary to finish the curbing, to pave some crossovers between the lanes, and to perform the usual cleaning-up operations. The new road was officially open to traffic July 1.

### Grading and Form Work

After the subgrade material had been spread and compacted, the form trench was dug by hand to receive the Heltzel 9-inch forms. There were about 5,000 feet of these on the job, with at least 400 feet always kept ahead of the paver.

They were placed 24 feet apart since this was all new location and full-width paving was in order with no traffic to be maintained. An R-B Finegrader then rolled over the forms. When it had removed the surplus material, the subgrade was given a further rolling by a 5-ton 3-wheel roller. A final test for correct depth was then made with

a scratch board, the forms were oiled, and the subgrade wet down if necessary.

### Joints

On both the full-width slabs a longitudinal tongue-and-groove joint, formed with a shaped steel plate, was (Continued on next page)



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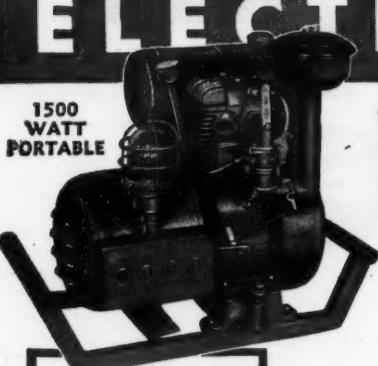
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**"U. S."** ELECTRIC PLANTS

## By-Pass Is Completed With Concrete Paving

(Continued from preceding page)

placed at the center line. Deformed tie bars,  $\frac{1}{2} \times 30$  inches, were strung along this joint at 30-inch intervals. They were held in position at half the slab depth by two pins driven into the ground. The tie bars pass through loops at the tops of the pins.

The transverse expansion joints consist of asphalt-impregnated felt,  $\frac{3}{4}$  inch thick and  $8\frac{1}{2}$  inches deep. When they were set on the grade their tops came  $\frac{1}{2}$  inch below the surface of the concrete. A metal cap fitted over the joint and was later removed by the finishers. Running through the joint at half the slab depth are  $\frac{3}{4}$ -inch plain round dowels 12 inches long on 12-inch centers. They are fixed at one end, but their other end is in a metal sleeve to permit sliding.

The transverse contraction joints are simply  $\frac{3}{4}$ -inch plain round dowels, 12 inches long on 12-inch centers, painted and greased on one half, and embedded in the concrete at half the slab depth.

For experimental purposes the northbound lane was divided into several sections with varied joint spacing. Beginning at the north end the first section of 1,070 feet was constructed without expansion joints but with contraction joints at 20-foot intervals. The usual wire-mesh reinforcement was omitted from this section. Next came a 2,600-foot stretch with one expansion joint at the center of the section, and contraction joints on 40-foot centers. This and the remaining sections were reinforced with wire mesh.

The remainder of the northbound lane was divided into three 6,000-foot sections. The first had expansion joints every 1,500 feet and contraction joints every 30 feet. The next section to the south had expansion joints at 1,000-foot spacing and contraction joints on 25-foot centers. The final south section had expansion joints every 500 feet and contraction joints every 20 feet.

All joint assemblies, dowels, and American Steel & Wire Co. wire-mesh reinforcement were purchased from the Virginia Steel Co. at Richmond. They were shipped 60 miles on the Richmond-Fredericksburg & Potomac railroad to the Fredericksburg station, and then hauled to the job by truck.

### Concreting

Batches of sand and gravel for the concrete were purchased from the Massaponax Sand & Gravel Co. of Fredericksburg. The material at its plant was loaded into an average of 14 trucks, holding three batches each, for hauling to the paver. There Penn Dixie bag cement was added. This cement was shipped from Bath, Pa., via the Pennsylvania and the R. F. & P. railroads about 200 miles in freight cars to Fredericksburg. There it was unloaded by hand to flat-bed trailer trucks, holding 250 bags each, and hauled to the job. Water for the mix was pumped from near-by creeks into two Chevrolet 1,000-gallon tank trucks by a 3-inch pump, and it was then delivered to the paver. A Jaeger 3-inch pump placed on the Ransome 34-E dual-drum paver pumped the water from the tank trucks as they took up positions alongside the paver.

The 8-bag batch contained the following proportions by weight:

Cement	752 lbs.
Sand	1,528 lbs.
Washed gravel	2,720 lbs.

Theoretically, 6 gallons of water per bag or a total of 48 gallons was to be added to this dry batch. But actually, because of the moisture usually contained in the aggregate, only about

30 gallons was added at the paver. This Class X concrete had a cement factor of 1.5, and the average slump was  $1\frac{1}{2}$  to 2 inches. The gradation of the aggregate, both coarse and fine, in a typical batch was as follows:

Sieve Size	Per Cent Passing
Coarse Gravel	
2-inch	100.0
1-inch	7.6
$\frac{3}{4}$ -inch	0.7
Fine Gravel	
1-inch	97.0
$\frac{1}{2}$ -inch	34.2
No. 4	5.4
Sand	
No. 4	100.0
No. 20	53.0
No. 50	9.4
No. 100	2.0
No. 200	0.4

crete sufficiently low for placing the wire-mesh reinforcement. After screeding this shallow cut in the mix, the machine dropped back and the mesh was added. Then with the board raised, the finishing machine advanced to level off the concrete with the top of the forms. No vibrating was done.

Following the finisher came a Flex-Plane machine which cut slots in the concrete for both the longitudinal and

contraction joints. Into these slots the finishers inserted steel strips,  $2\frac{1}{2}$  inches deep and  $\frac{1}{4}$  inch wide. The contraction-joint strips were 24 feet in length for the full width of the pavement, but the longitudinal-strip steel came in 4-foot lengths which locked together.

Directly behind the joint-cutting machine came a Koehring Longitudinal Finisher. This was followed by the

(Continued on next page)

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endless hours of operation. They have the power to meet all digging conditions. They have the speed to clean up jobs in a hurry. They should be working for you.

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## By-Pass Is Completed With Concrete Paving

(Continued from preceding page)

finishers with an 8-inch canvas belt extending across the full width of the 24-foot concrete. From a double bridge the finishers then pulled up the steel strips slightly at the joints and edged the slots with a  $\frac{1}{4}$ -inch-radius tool. The steel was not entirely removed until about 3 or 4 hours had passed, or until the concrete had acquired a slight set.

When the steel was finally removed, the concrete was cured with Aquastatic membrane compound sprayed on usually about 5 hours after the pour. This time interval was shortened if weather conditions warranted; that is, if the sun was exceptionally hot or a strong wind was blowing which would remove the surface moisture from the concrete. To insure an even application of 1 gallon for 33 square yards, a double bridge was used from which the spray was directed. This double bridge had channels for tracks placed 2 feet apart, over which a small cart containing the spraying unit was pushed. The unit consisted of a 25-gallon supply tank from which the compound was applied under 30-pound pressure, a Briggs & Stratton gasoline engine furnishing the power. The spray bar was a  $\frac{1}{2}$ -inch pipe with 10 nozzles. It was covered by a metal hood, 7 feet long x 3 feet wide, to prevent the liquid from being blown about in a wind. The unit was pushed back and forth across the bridge by hand. Within a day or two following a pour, the joints were filled with an asphaltic compound heated in a kettle.

The average day's run was 800 feet of 24-foot concrete pavement in a 10-hour working day. Where the median strip is 20 feet wide, the paver worked up the center of the roadway. But at the north end where the strip is only 4 feet wide, the southbound lane was covered with 2 to 3 inches of subgrade material so that the paver might operate on top of the slab. This gravelly material was hauled from the borrow pit, dumped on the road, and spread evenly by the grader. When both lanes were poured, the grader scraped the material from the concrete, forming a windrow along the inside edge of the pavement. When the curbs on each side of the 4-foot median strip were finished, the material was used to fill in the space between. This transfer was done by hand shovels. When pouring the crossovers, the paver worked on planks laid on the concrete.

### Curb and Gutter

The curbing was sublet to B. W. Jackson Co. of Richmond, Va., with A. S. Penny, Superintendent. The cement-concrete curbs are 18 inches deep, 7 inches wide, and project 7 inches above the highway pavement. Wooden 2 x 6's were fashioned into curb forms having 2 x 4 studs every 30 inches; cross bracing between the curbs consisted of a 2 x 4 placed every 3 or 4 feet. The curb has a bevel on the side next to the pavement. The



C. & E. M. Photo  
E. W. Hechler Co. used a Ransome 34-E dual-drum paver with a 30-foot boom on its contract for paving the Fredericksburg By-Pass in Virginia.

form for this edge was held in place by three pieces of strap iron,  $1\frac{1}{2}$  inches wide, which were bent over the rear form. The curbs were poured from truck-mixers of the Massaponax Sand & Gravel Co. which supplied the concrete. The maximum size of the gravel

aggregate was 1 inch.

Gutters constructed of cement-sand blocks were placed in all cuts on top of a 2-inch layer of coarse sand. Three blocks, each 8 x 16 x 3 inches, formed the gutter. The center line of blocks runs lengthwise; the two outside have

their long dimension at right angles to the center row.

### Seeding

On the median strip, 4 inches of top-soil containing principally bluegrass roots and stolons was placed in preparation for the seeding, fertilizing, and mulching. The seed mixture sown at the rate of 50 pounds to the acre consisted of:

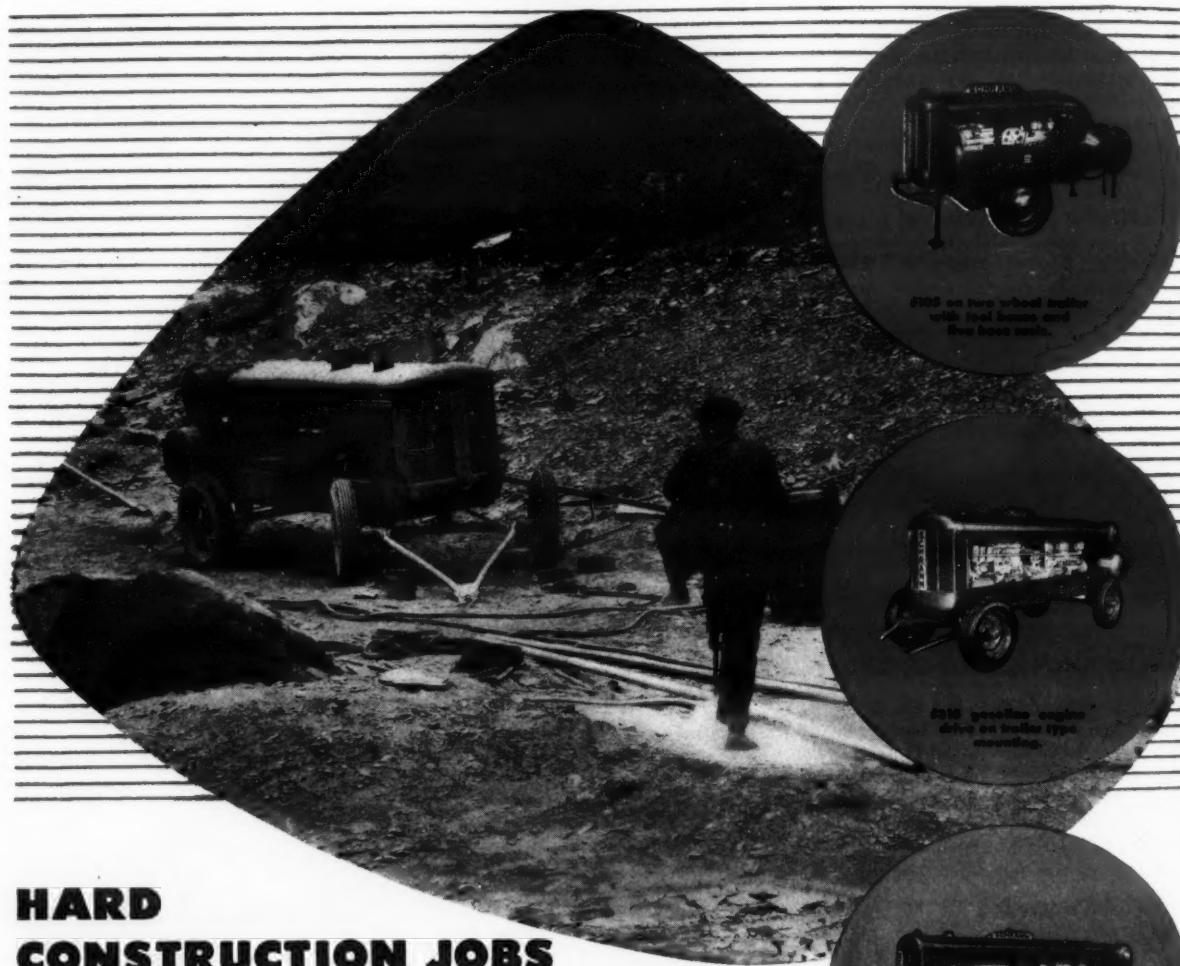
Redtop	20 per cent
Domestic ryegrass	20 per cent
Kentucky bluegrass	50 per cent
White Dutch clover	10 per cent

The fertilizer contained nitrogen at the rate of 2 pounds, and phosphate and potash at the rate of 1 pound, per 1,000 square feet. The mulch cover was distributed 2 tons to the acre. The roadway slopes are also topsoiled and seeded in like manner.

### Quantities and Personnel

The major items for the highway work included:

(Concluded on next page)



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Schramm Compressors range in size from 20 to 420 cu. ft. actual air, in every type of mounting and assembly.

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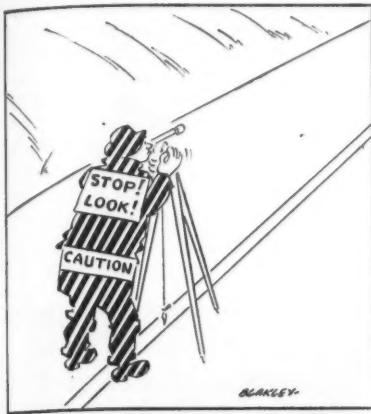
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## By-Pass Is Completed With Concrete Paving

(Continued from preceding page)

Excavation	23,355 cu. yds.
Subgrade material (6-inch layer)	3,810 cu. yds.
Concrete pavement	56,945 sq. yds.
Cement-sand block gutters	4,337 sq. yds.
Topsoil	10,856 cu. yds.
Seeding	41 acres
Curb and soil median strip	6,332 lin. ft.

The contract price, including the four bridges, which the E. W. Hechler Co. sublet to the Bowers Construction Co. of Raleigh, N. C., was \$787,061. H. L. Howard was Superintendent for E. W. Hechler Co. and worked an average force of 40 men during normal operations. For the Virginia Department of Highways, J. H. Walker is District Engineer and C. W. Staggs is Resident Engineer; on the project the Senior Inspector was J. C. Shelhorse, with assistants. The Department is headed by James A. Anderson, Commissioner, with C. S. Mullen, Chief Engineer, and T. F. Loughborough, Construction Engineer.

## South America Plans Trans-Andean Tunnel

Plans have been released in South America for the longest mountain tunnel in the world. Crossing through the Andes, it will stretch for 12½ miles from Puente del Inca, Argentina, to the confluence of the Quebrado de Navarro and Juncal Rivers in Chile.

The tunnel is to be financed by the two republics through foreign loans. It will have an average altitude of 8,465 feet above sea level. This is 1,969 feet lower than the present international tunnel, which cannot be used for several months each winter.

Preliminary findings prepared by an Argentine-Chilean technical commission recommend three types of construction: a single-track railway tunnel, two single-track railway tunnels, or a single-track railway tunnel and a 2-way motor-traffic tunnel. The first two types necessitate no artificial ventilation. They provide for the movement of automotive traffic on flat cars by an electrically driven motor unit.

Varying with their complexity, the tunnels would cost respectively \$13,500,000, \$21,750,000, or \$42,500,000, the commission estimates. International broad-gage railway track would be used in any system chosen. To build the Chilean approaches will cost \$4,750,000, and those on the Argentine side, \$3,000,000.

## India Engineers Visit U.S.

Highway-construction methods in England and the United States are being studied by 22 public-works engineers from India. They are visiting America under the auspices of the Indian Agency General at the British Embassy. The group was welcomed officially in Washington, July 31, by Major General Philip B. Fleming, Federal Works Administrator, and Thomas H. MacDonald, Commissioner of the Public Roads Administration, both of whom visited India last spring as consultants to the Government on highway build-

ing.

All the visiting engineers are officials in the national, provincial, or municipal governments of their country. They plan to spend several weeks in Washington hearing lectures and participating in group conferences with PRA officials and engineers.

## Tar Manual Available

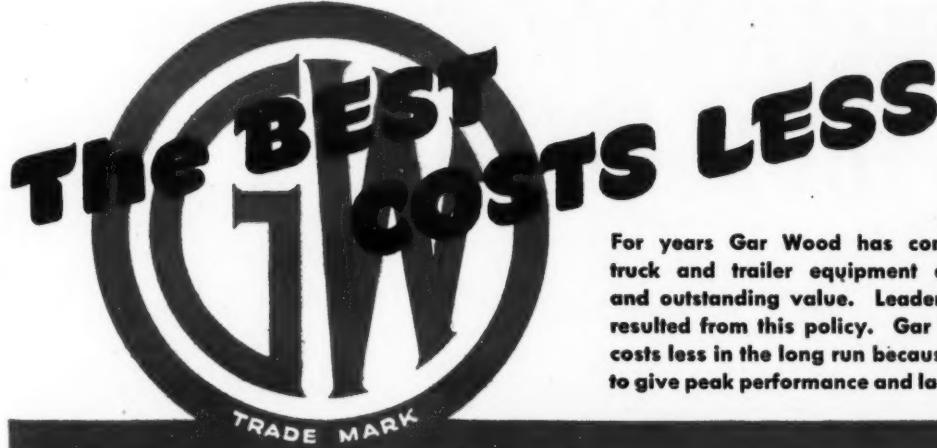
Applications of Tarvia and Tarvia-lichic paving materials in both construction and maintenance are discussed by the Barrett Division of the Allied Chemical & Dye Corp. in its "Tarvia Manual". The well illustrated 64-page pamphlet describes the operations and pavement types in which the Barrett products are used. Tables list recommendations and construction steps.

Copies of this manual, Form 745, can be obtained from the Barrett Division. Merely drop the firm a card, mentioning this notice. The address: 40 Rector St., New York City 6, N. Y.

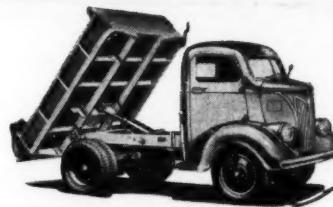
## Steel-Fabricating Firm Marks 50th Anniversary

The achievements of 50 years of bridge building are graphically portrayed by the Fort Pitt Bridge Works in a booklet issued to mark its golden jubilee. Not only does Fort Pitt engineer, fabricate, and erect bridges; it also produces steel for concrete reinforcing, and for many structural needs.

Bridges, grade separations, high-speed highways, power houses, buildings and other installations using Fort Pitt steel are pictured in the 56 pages of the anniversary booklet. Readers of CONTRACTORS AND ENGINEERS MONTHLY will find the brochure an interesting contribution to the pictorial history of American construction. Copies can be obtained by writing to Fort Pitt at 212 Wood St., Pittsburgh 22, Pa.



For years Gar Wood has consistently offered truck and trailer equipment of utmost utility and outstanding value. Leadership in this field resulted from this policy. Gar Wood equipment costs less in the long run because it is better built to give peak performance and lasting satisfaction.



Type C12 Body and Model D6 or D7 Hoist. Dumping angle 55°.



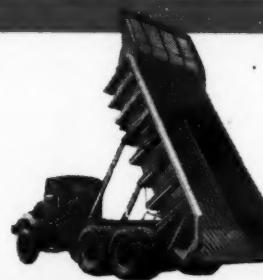
Type X-112 Extra heavy duty Body with automatic downfolding tailgate.



Special rock Body, scoop type rear end. Model F4CA cam and roller Hoist.



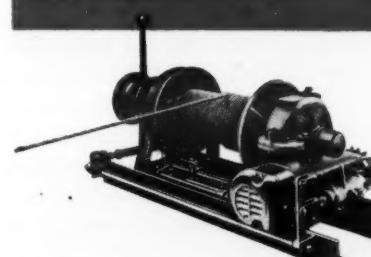
Type W12 Body, Model F4C cam and roller Hoist. Capacity 6 cu. yds.



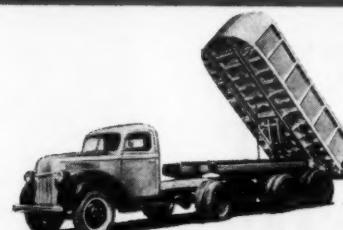
Type X-112 Extra heavy duty Body, scoop end, with Model T-4440 Hoist. Capacity 19 cu. yds.



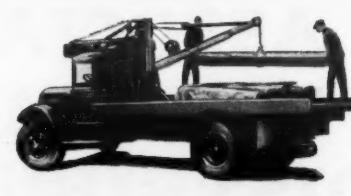
Type W12 Body, front recessed for Model TV83 Hoist. Capacity 15 cu. yds.



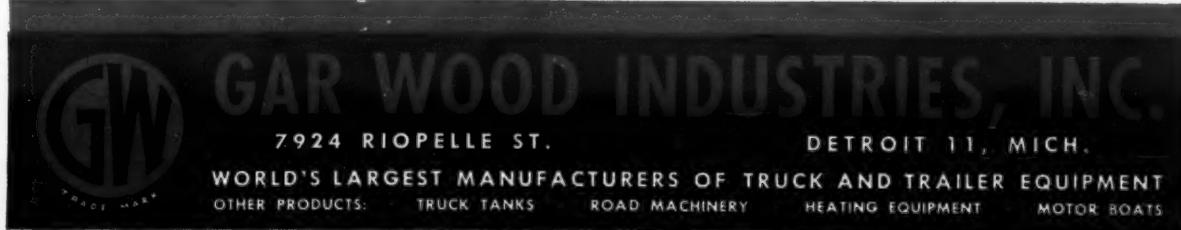
Rapid Reverse truck Winch. Single lever control. Capacities 15,000 to 60,000 pounds line pull.



West Coast Special W-12 Body, Model F8C cam and roller Hoist. Capacity 10 cu. yds.



Telescopic boom Crane. Radius 8 to 20 feet.



## Chile Improves Roads; -Official Visits U.S.A.

Plans for resuming its highway improvements are now under way in Chile. Our Latin neighbor launched this ambitious program in 1940, only to have the war suspend all activity. The country, which in 1938 was devoting 17 per cent of its import budget to transportation equipment, expects highway travel to play a big part in its future development.

Thanks to its "string-bean" geography (it stretches along the Pacific coastline of South America for nearly 3,000 miles), Chile has been more fortunate than its fellow republics in the matter of transportation. However, to supplement shipping and extensive railways, it is now necessary to expand her highway system.

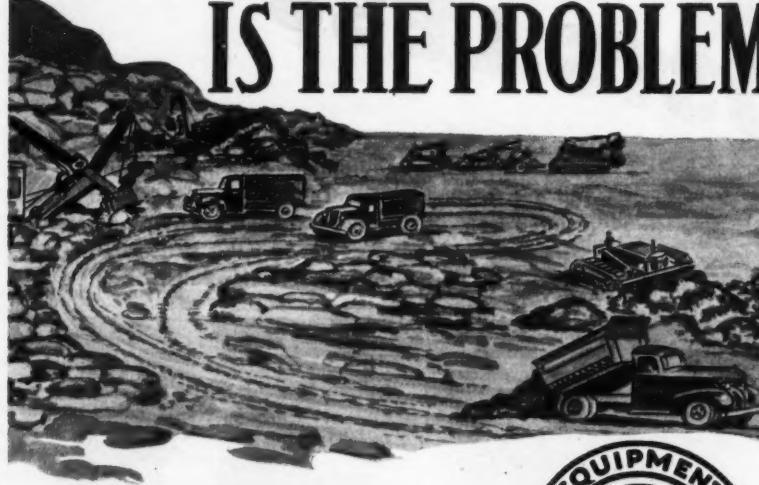
The projected road network will make it possible for farmers in the fertile central valley to raise and market more perishable food crops. This will stimulate the national agriculture

and mean sounder economy for city dwellers and workers in other sections of the country. The nation has extensive natural resources yet to be developed, including petroleum, coal, iron, and water power.

The biggest road job in Chile today is the modernization of the Pan American Highway link between the capital, Santiago, and the Peruvian border. Passable all year round, the road is only partially hard-surfaced throughout its 1,000-mile length. The fact that much of it traverses rough mountain country creates many bridge-building problems.

Visiting in the United States on a "good neighbor" tour, at the invitation of the Institute of Inter-American Affairs, the Chief of the Chilean Division of Bridges, Alberto Claro Velasco, is studying bridge construction, among other things. As guest of American government and industry, Señor Claro began a 3-month nation-wide tour in June, to study engineering methods, various projects, and the building of equipment.

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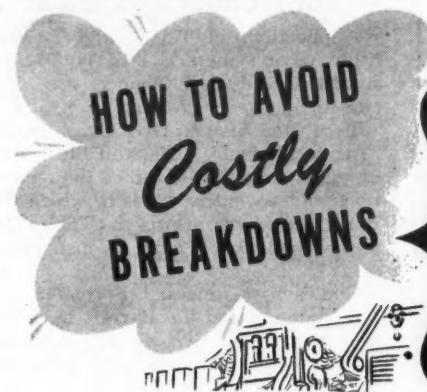
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## Financing Equipment Purchases and Sales

Both equipment dealers and contractors will be interested in details of the special financing plan set up by C.I.T. Corp. for the nation's construction industry. The plan is outlined in booklets available from C.I.T.

One booklet, for dealers, describes the financing of purchases and sales of construction equipment. The other, for contractors, details the steps a contractor must take to receive C.I.T. aid in getting new equipment.

Write the C.I.T. Corp. at 1 Park Ave., New York City 16, N.Y., for the booklet you want.

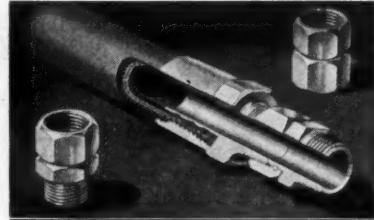


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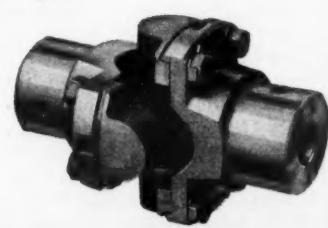


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Universal Joints

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**MECHANICS UNIVERSAL JOINT DIVISION**

Borg-Warner • 2026 Harrison Ave., Rockford, Ill.

# Sea Wall

(Continued from page 1)

sands away from in front of the piling, and permitted the seas once more to make their way under the wall and to attack the land in the rear. This latest smash of nature showed that piling 6 feet long did not go deep enough to provide the required protection. Consequently the plans were changed, and the remainder of the 6-foot pile sections were removed and welded together to form 12-foot sections. A 425-foot stretch of wall has now been strengthened with this type of construction. If it meets the test and if funds permit, similar reinforcing will be done to other parts of the wall where danger of a break-through and subsequent erosion is greatest.

## Concrete Wall and Walk

The present concrete wall, built in 1927, was constructed by driving 30-foot reinforced-concrete piles, 17 x 24 inches in cross section, on 14-foot centers. The 17-inch sides face front and back. The other sides are recessed with 8-inch-square slots into which are framed three precast 8 x 27-inch concrete slabs forming the wall proper. The 20-foot walk consists of a 5-inch concrete deck slab. This is supported on the concrete piles in front and on a row of wooden piles at the rear, also on 14-foot centers, and capped by 4-foot-square blocks of concrete. A pipe railing gives protection at the ocean side of the wall. The land side, before the storms, was level with the lawns that led down from the many beach-front hotels.

The wall is 7 to 8 feet high above beach level. That the bottom of the lowest precast slab is embedded only about 2 feet into the shifting sands, explains why the original breaches below the wall were possible. Virginia Beach has no groins or piers projecting into the ocean which would help to stabilize the beach front and prevent lateral sand movements. As a result, the erosive force of the surf has been unhampered by any man-made checks or barriers.

## Sheet-Pile Wall

Work started, according to the latest design of strengthening the wall, near the end of March. At that time, the 6-foot lengths of piles were pulled in preparation for welding them into 12-foot lengths. The steel sheeting,  $\frac{1}{2}$  inch thick and 19 inches center to center of interlock, was stacked in a lot fronting on the beach. A wooden workbench, long enough to accommodate two 6-foot lengths, was constructed with the sides higher than the center so that the steel was seated firmly in place with little likelihood of movement. Welders with oxyacetylene torches first removed the rust from the area to be welded, and squared off the ends by burning. The two ends were then brought within  $\frac{1}{8}$  inch of each other, leaving room for the welding metal to run through and fill the crack. Welding was done by a portable G-E 300-amp electric arc welder with 5/32-inch rods.

Timber sections, 15 feet long and 8 inches square, were then stretched out at beach level against the front face of the concrete wall piles to act as a line for driving the steel sheet piling. The 12-foot sections were driven by a McKiernan-Terry No. 7 steam hammer in 20-foot swinging leads suspended from the 50-foot boom of a Northwest crane. A 50-hp coal-burning vertical boiler set up behind the wall furnished the steam for the hammer. In the beginning a 500-pound drop hammer was used. But it proved ineffective in the heavy wet sand and was replaced with the more powerful steam hammer. Driving was also helped by jetting with



C. & E. M. Photo

A section of the concrete sea wall at Virginia Beach has been strengthened by driving steel sheet piling (shown in the foreground at the foot of the wall) and tying and bracing it with 8 x 8 timbers.

a 2-inch pipe reduced at the end to a  $\frac{3}{4}$ -inch nozzle. Water was taken from city hydrants on a street paralleling the "board" walk, and conveyed to the jet

line in a 3-inch hose 300 feet long.

Every 300 feet along the beach, 10-foot-wide concrete steps were attached to the front of the wall. Insufficient headroom prevented the use of the steam hammer under the steps, so in these locations the piles were driven by an air hammer powered by an Ingersoll-Rand 105-cfm air compressor. The piles were driven and jetted to full depth, level with the top of the 8 x 8 timber, with no cut-off at the top.

It was necessary to provide a working area protected from the surf, where-in the steel sheet piling could be tied to the existing concrete sea wall. So a sand dike was thrown up in front of the wall to a height of about 5 feet, and 15 feet from the sheeting. This dike was made by the crane using a Haiss  $\frac{5}{8}$ -yard clamshell bucket. It was usually about 50 feet long covering three 14-foot sections of the original wall. At each end, sand wings tied the dike back to the wall, and the area enclosed was pumped out when necessary by a Mar-

(Continued on next page)

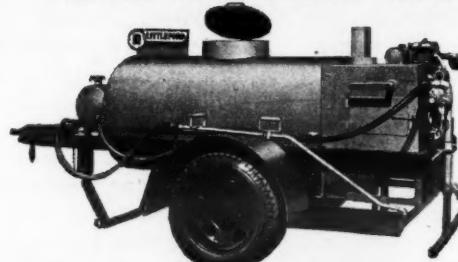
## WHEN ROAD REPAIR IS NEEDED HERE'S THE EQUIPMENT FOR THE JOB



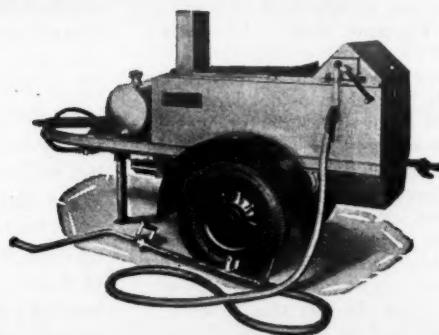
TRAIL-O-ROLLER



101 UTILITY SPRAY TANK



84-HD ASPHALT KETTLE



These Littleford Units are the modern efficient, low cost operating units, designed for the big road repair program ahead. The 84-HD is the fastest heating Kettle made today, having patented Littleford features.—The 101 Utility Spray Tank combines three units in one.—Trail-O-Roller is the portable roller that gives as much compaction as a five ton tandem.

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C. & E. M. Photo  
This view along the line of steel sheet piling shows the method of tying it to the existing concrete wall.

## Sea Wall

(Continued from preceding page)

low 4-inch pump. Without this protecting dam, work on the timber ties could have been carried on only at low tide when the beach is from 50 to 75 feet wide. At high tide the surf comes pounding up to the very foot of the wall.

### Piling Tied to Concrete Wall

In front of the sheet piling, other lengths of 8 x 8-inch timbers were stretched out with their top side level with the top of the sheeting. Blackhawk 12-ton jacks were used to hold the timbers in position until they were permanently secured to the concrete wall. At the rear of the wall similar 8 x 8's were placed against the concrete piles at the same level as the front bracing. Galvanized-iron bolts, 1 1/4 inches in diameter x 5 feet long on 38-inch centers, were then used to tie the steel sheeting with its timber bracing to the concrete wall.

This work involved making holes in the sheet piling, the concrete wall, three 8 x 8 timbers—two on the ocean and one on the land side—as well as through an 8 x 8 filler block on each side of the recessed slabs comprising the concrete wall. Probably the toughest part of the whole job was to get the holes in line through the successive materials of wood, steel, wood, concrete, and wood again, from the outside to the inside of the wall, so that the bolts could be passed through. At one point this operation was speeded up and the cost reduced by sawing slots in the 8 x 8 x 8-inch filler blocks instead of drilling holes. The slots were cut 1 1/8 inches wide, half the depth of the blocks. The blocks were then slipped over the bolts between the concrete wall and the 8 x 8 wales on each side.

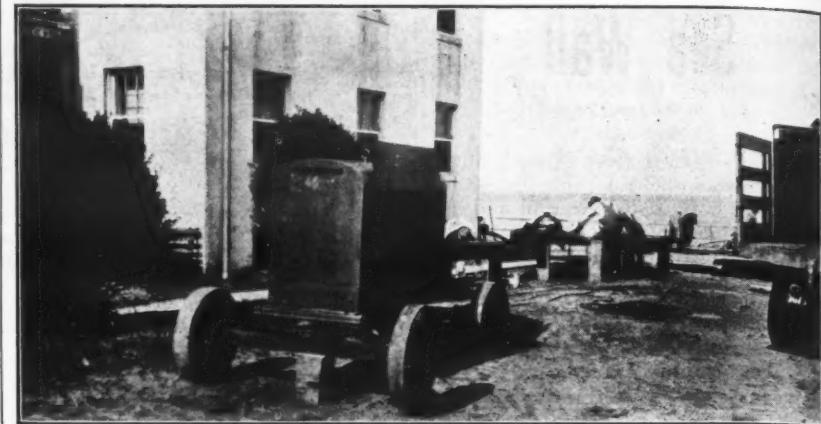
In the sheeting, the holes for the bolts were burned out by the welding torch. The 8-inch concrete wall slabs were drilled with a Gardner-Denver air hammer using 1 3/4-inch bits on 1-inch hexagonal drill steel in 5-foot lengths. Holes, 1 5/16 inches in diameter, were made in the timbers by an Ingersoll-Rand wood borer driven by the air compressor, and also by a Van Dorn 5/8-inch-shank electric drill. Power for the drill came from a Universal portable 5-kw generator which also furnished electricity for night work. Working hours were irregular on this project, for advantage had to be taken of low tide to do work which could not be done when the tide was at the flood.

Assembling the bracing and tying it and the sheet piling to the concrete wall was a laborious hand operation. It was also complicated by the fact that the

existing wall was not perfectly straight, and that the sheet piling could not always be driven to absolute plumb. First the 5-foot bolts were threaded through from side to side. Then 5-inch washers were placed at the ends and nuts were screwed firmly into place, taking up all slack. This made the combination concrete and steel wall a complete unit. In height it is nearly 20 feet, of which 12 is buried deep in the sand. Further bonding was done by filling the area between the concrete wall and the outer 8 x 8 timber with a 1 to 2 to 4 concrete using 1/2 to 1 1/2-inch gravel for the coarse aggregate. The depth of this fill extends from the top of the timbers to 6 inches below their bottom face.

### Temporary Solution

As the new wall was being built, the crane worked along the beach. It clammed sand from the ocean side, swung it over the walk, and piled it up in the great washed-out areas. These were 7 to 8 feet deep, and extended 30

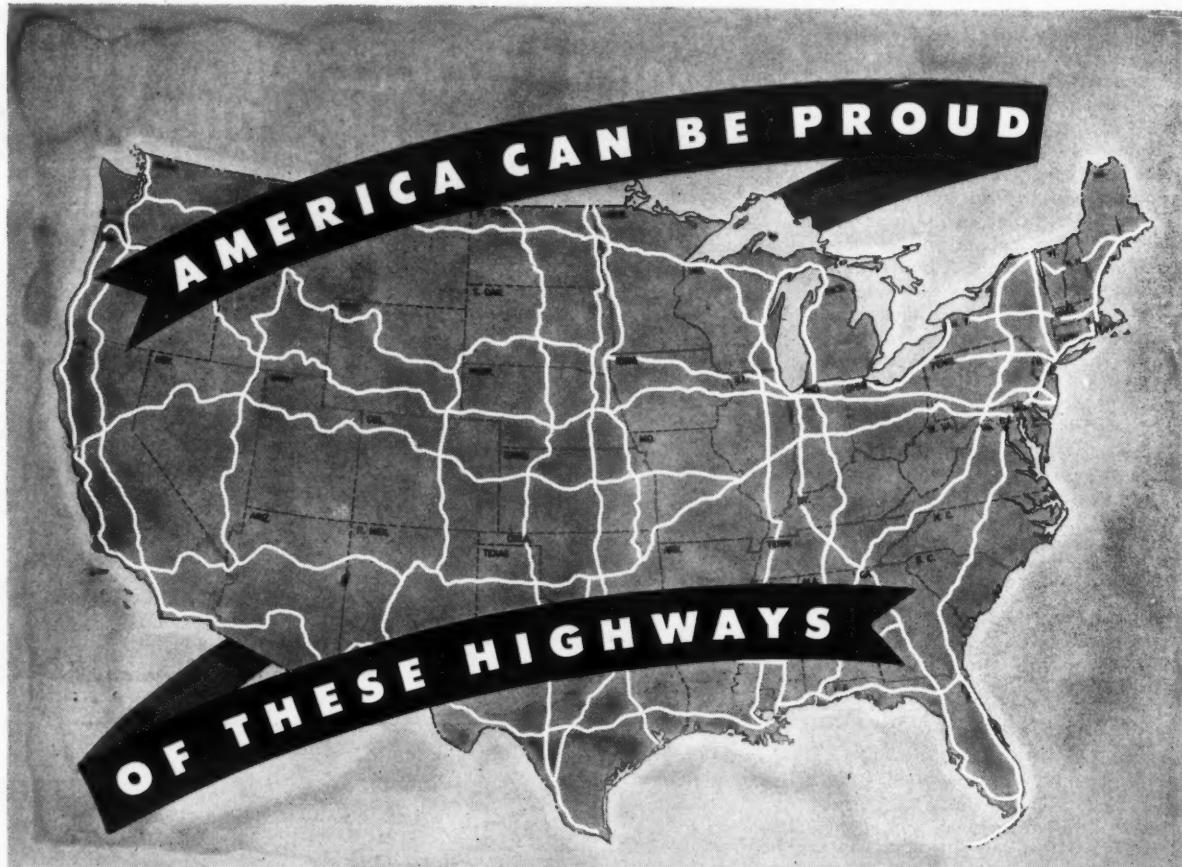


C. & E. M. Photo  
To lengthen the steel sheet piles used to prevent erosion along the sea wall at Virginia Beach, 6-foot sections were welded together into 12-foot lengths. A G-E 300-ampere electric welder was used.

feet back from the inside edge of the walk in some locations to the very doorsteps of hotels. When the wall was finished, the piles of sand were washed under the walk with water from the sea

pumped out by the Marlow 4-inch pump. Additional sand was then deposited by the crane until the ground was once more level with the concrete

(Concluded on next page, Col. 2)



Shown on the map above are a few of the principal highways of the great U. S. highway network, now 30 years old and begun with passage by Congress of the Federal-Aid Road Act in 1916. And it's just 20 years since U. S. highways have been uniformly marked, with north-south routes given odd numbers from 1 to 101, and east-west routes even numbers from 2 to 90. U. S. feeder routes have higher numbers with final digits referring to the main roads they serve.

There's a lot of history and romance in our highways, many of them following old wagon trails of pioneer days. What tourist, planning a long motor trip, hasn't thrilled to vistas opened up by U. S. 1... U. S. 11... U. S. 41... U. S. 2... U. S. 30... U. S. 40... ribboning away for hundreds of miles, up and down and across the land? And what businessman or salesman, travel-

ing long distances by automobile, hasn't been conscious of the benefits afforded by Federal highways?

By supplying contractors with the steel products needed for modern concrete roads and for bridges of all types, Bethlehem has had a part in the building of many of the important links in our national highway system. Today, with so many highways to be repaired or relocated, and new bridges built, Bethlehem again offers well-rounded service and a line of road steels designed and built for top-notch performance. If you have a highway job coming up in the near future, we suggest you get in touch with the nearest Bethlehem district office.

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

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- Corrugated Sheets
- Tie Rods, Spikes, Bolts and Nuts



## STEEL FOR HIGHWAYS



The latest Huber roller is in the 5 to 8-ton class and is featured by a fluid coupling designed for improved performance and longer life.

## New Fluid Coupling Marks 5-8-Ton Roller

A fluid coupling, a new development, features the latest Huber 5 to 8-ton tandem roller. Powered by a Hercules engine, the roller has a speed range from 1.95 to 3.62 mph. The innovation eliminates the roller's usual master clutch. Consisting primarily of two parts, the fluid coupling transmits the engine power from a driver to an impeller through the medium of oil. It does not provide any change in the gear ratio, as it is not a torque converter, Huber says.

Eliminating the direct mechanical connection between the engine and final drive protects the gears, bearings, and reverse clutches against torsional vibrations and shock loads, Huber claims. The coupling keeps the engine from stalling or being killed by an over-load, and prevents the roller running away should the engine cut out. Shock on reversing is also eliminated, the firm says.

The tandem roller is 173 inches long, 63 wide, 85 high; its ground clearance is 10 inches. The compression roll has a 52-inch diameter and a 50-inch width. The steering roll has a 40-inch diameter and a 50-inch width. Total weight of the new roller, with ballast, is 16,100 pounds.

Full details about the Huber roller can be obtained by writing the Huber Mfg. Co., P. O. Box 501, Marion, Ohio.

## How to Record, Map Road Right-of-Ways

Highway officials will be interested in a recently published monograph, "Elements of Highway Land Acquisition Plats and Records". It was written by David R. Levin, Senior Transportation Economist for the Public Roads Administration.

Under the present Federal-Aid set-up, the acquisition of land for highway use is channeled through existing state and local highway departments. Mr. Levin's booklet aims to create minimum standards for the various systems of plats and records which are used. To accomplish this would aid the states in the acquisition of lands required for highway purposes. It would also safeguard the public interest.

The booklet presents a background of land-acquisition techniques. It urges no radical departures from present accepted practices of recording and mapping. The standards set up are already used by some states. They represent a composite of the techniques believed to be most desirable, and are adaptable to variations under local conditions.

Mr. Levin's book is in the form of notes, liberally illustrated by examples and sample sheets. Project strips and maps for individual parcels are presented in the book to illustrate the author's points. A skeleton recording and accounting system for all the details involved in land acquisition is presented in great detail. Printed in large pamphlet form, the book has 26 pages of text, and as many or more of illustrative matter.

## Sea Wall

(Continued from preceding page)

walk as it was before the ocean broke through in its erosive sweep.

This sheet-piling construction to add depth to the present wall is considered a temporary measure to save the concrete walk and the buildings behind it from possible damage in future storms. But it is felt that construction of a similar nature would be a protection to those sections of the beach where the improvement does not now extend. Deep walls firmly anchored in the sands, together with a system of groins and jetties, are a big help in checking erosion and holding a beach in place.

## Personnel

The work was performed by the Norfolk office of the Vanguard Construction Corp. of New York City. All work in the Norfolk District is under the direction of A. Kouri, District Manager, and Frank Walski, General Superintendent. The work at the sea-wall project was under the direct supervision of A. C. Peterson. For the City of Virginia Beach the work was in charge of Russell McCoy, City Engineer.

## Pick-Up-Truck Covers

Pick-up trucks can now be converted into covered models, the C. K. Turk Corp. reports. The firm has introduced Caravan Top, an aluminum frame covered with heavy duck for fitting on the pick-up body.

Assembled by one man, the Caravan Top unit can be mounted or demounted at will, Turk says. Side zippers feature the back curtain, which can be rolled up out of the way. Made to fit most standard-make pick-up trucks in the 1/2 to 1 1/2-ton range, Caravan Top is sturdy enough to support a man's weight, it is said.

Details on Caravan Top can be obtained from the C. K. Turk Corp., 1122 Mishawaka Ave., South Bend, Ind. Tell the firm you saw this report.

## New Sheave Puller

Designed to simplify the removal of single and multiple-drive sheaves without distorting them, a sheave-puller attachment is being offered by the Owatonna Tool Co. The unit can be used with the OTC Grip-O-Matic or Push-Puller tools.

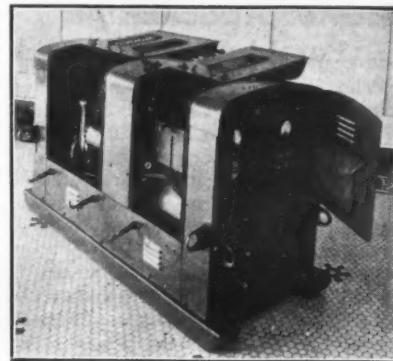
This attachment, No. 679, clamps

down in the V-groove, thus distributing the pulling strain evenly around a large part of the sheave's periphery, Owatonna says. Full details can be obtained from the firm at 348 Cedar St., Owatonna, Minn.

## Engine Generators: Sets Available Now

Engine-generator sets, built to Army specifications, are available for immediate shipment to civilian firms, a Los Angeles distributor, Ives, Greene-Haldeman Equipment Co., announces. These 3-kva units have a wide range of use in contracting and highway maintenance.

Available in either 3-phase or single-phase models, the sets have been used only for test runs or stand-by service, the distributor says. A Hercules Model ZXB gasoline engine of 9 1/2 hp serves as power source. The Hobart generator produces 115, 120, or 125 volts of 60-cycle current at 1,200 rpm, or 50-cycle



Immediately available for shipment are these 3-kva gasoline-engine-powered generator sets distributed by Ives, Greene-Haldeman Equipment Co.

current at 1,100 rpm. Built on skids, the unit is fully enclosed, compact, and lightweight.

Offered at reduced prices, these power sets can be ordered from Ives, Greene-Haldeman Equipment Co., 1150 So. Flower St., Los Angeles 15, Calif.



## LIGHTER • FASTER • CHEAPER

No board is too tough for this new powerful, high speed MallSaw that is priced within reach of every builder. It will rip or cross-cut any kind of rough or dressed lumber up to 2", leaving a square board end that assures better fitting and a better building. When equipped with a Mall long-wearing abrasive disc, it can be used for grooving mortar joints, cutting and scoring tile, limestone, concrete and other aggregate compositions. The light weight, rustproof aluminum alloy housing, comfortable handle with trigger switch, and perfect balance, make for easy handling. Equipped with universal motor. Available in two voltages, 110-volt AC-DC or 220-volt AC-DC 60, 50 or 25 cycles. Has 6" diameter blade.

Ask your Distributor or write for literature and prices.

MALL TOOL COMPANY, ★ 7743 South Chicago Ave., Chicago 19, Ill.

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For Better Work"

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Barnes (7M) Automatic Centrifugal Pumps (The Streak) are available for immediate delivery. You don't have to wait. Order 1, or order 100. Your order will be filled upon receipt. You can "go places" with Barnes. You can do more with Barnes.

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THE STREAK (7M) 2-inch  
Complete line of pumps ranges  
in size from 3,000 gallons per  
hour to 90,000 gallons per hour.

## Tractor Attachments For Light-Duty Work

The Workmaster front-end loader, built by the New Method Equipment Co., is adaptable to light-duty digging, lifting, and bulldozing of the type met in roadside maintenance, park and reservation work. This tractor attachment is built for row-crop and tricycle-type tractors.

Interchangeable items, a scoop and a bulldozer, feature the Workmaster. The all-steel control frame is mounted on the tractor's front end, and braced against the rear axle. Operations are controlled through a belt-power hoist and a single control winch. The winch has a  $\frac{3}{8}$ -inch steel cable.

When using the scoop attachment, the Workmaster can lift approximately 7 feet, vertically all the way. The scoop has an automatic reset, and can be stopped at any height. It is 4 feet wide, and has a 14-inch-high back plate. A fixed bottom plate is 12 inches wide and has seven 32-inch teeth made of  $2 \times 2 \times \frac{1}{4}$ -inch angle iron. A 12-inch auxil-



The Workmaster loader for mounting on wheel tractors has a 7-foot lift and is designed to dump at any height.

iary plate to extend the bottom of the scoop is also furnished.

The Workmaster bulldozer replaces the scoop for leveling, ditch filling, cleaning off snow, etc. Its blade is 24 inches high  $\times$  5 feet wide, and is adjustable for straight dozing, or angling

up to 25 degrees on either side. It has spring-mounted gage shoes. Both blade and mounts together weigh only 185 pounds.

Further details about these tractor attachments can be obtained by writing

the New Method Equipment Co., Indianapolis, Iowa. Tell the firm you saw the Workmaster illustrated in CONTRACTORS AND ENGINEERS MONTHLY.

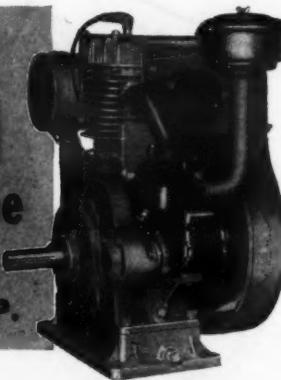
## Ice-Control Chemicals

Treating ice-control abrasives with calcium chloride saves in quantity of abrasives needed, in man-power, in equipment, time, and money, the Wyandotte Chemicals Corp. says in a mailing piece available to readers of CONTRACTORS AND ENGINEERS MONTHLY. The leaflet describes both the dry-flake method and solution method of applying the chemical. Write the firm at Wyandotte, Mich., for Bulletin C-61.

## Represents CSPA in Pa.

The appointment of Edward A. Walker has been announced as District Engineer representing the Clay Sewer Pipe Association in Pennsylvania. Mr. Walker will maintain offices at 503 Chestnut St., Greensburg.

This HEAVY-DUTY  
**WISCONSIN**  
Air-Cooled Engine  
IS AVAILABLE IN 4  
SIZES . . . 4 TO 9 H. P.



Illustrated above is the Models AEH to AHH series of 4-cycle single cylinder Wisconsin Air-Cooled Standard Engines, to which the following specifications apply:

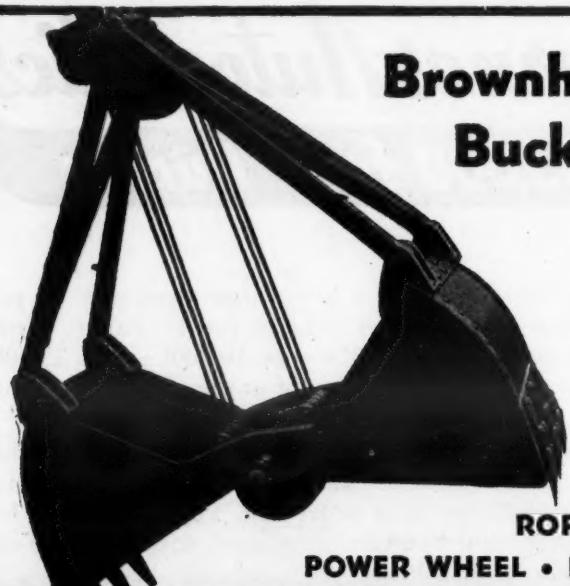
MODEL	AEH	AFH	AGH	AHH
Bore.....	3"	3 1/4"	3 1/2"	3 5/8"
Stroke.....	3 1/4"	4"	4"	4"
Cu. in. Displ.....	23	38.2	38.5	41.3
Hp. Range.....	4-6	5-7	6-8.5	7-9
Weight.....	130 lbs.	170 lbs.	175 lbs.	180 lbs.

If your equipment calls for an engine within the above power range, it will pay you to give serious consideration to the Wisconsin line . . . noted for rugged, heavy-duty serviceability and thorough-going dependability.

In addition to the engines listed above Wisconsin 4-cycle single cylinder engines are also available in 2 to 4 hp. sizes, and V-type 4-cylinder engines can be supplied in a power range of 13 to 30 hp. Detailed data furnished on request.

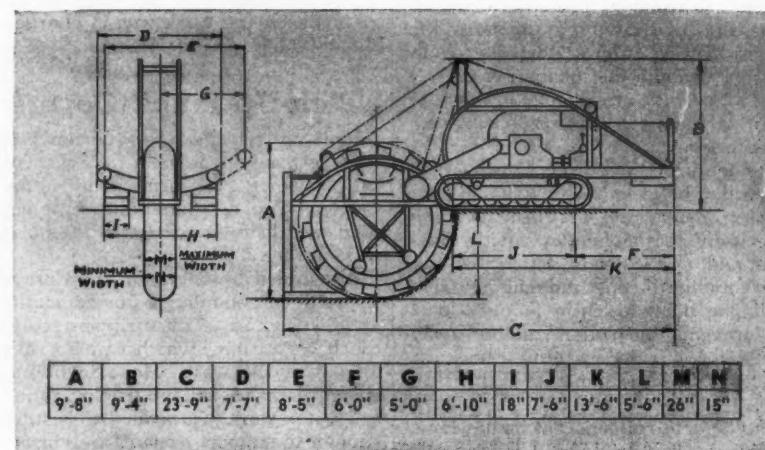
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DIGGING WIDTHS . . . . . Buckets only: 15" 18" 21"

With side cutters: 20" 23" 26"

DIGGING SPEEDS . . . . . 25 — from 2.5' to 118' per min.

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CONVEYOR BELT SPEEDS . . . . . 5 — from 45 to 330 feet

WHEEL SPEEDS . . . . . 5 — 36 to 266 feet per min.

POWER . . . . . Gas — Waukesha 6 cyl., 55 H.P.

Diesel — Caterpillar 4 cyl., 45 H.P.

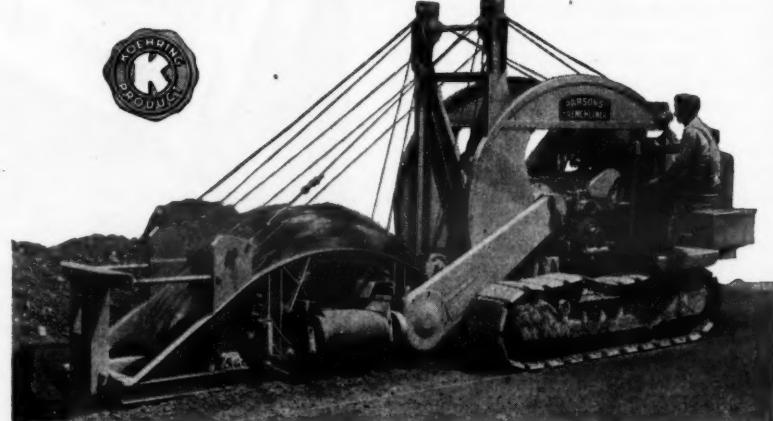
Diesel — International 4 cyl., 45 H.P.

Optional equipment for pipeline work.

TRACTOR TYPE CRAWLERS . . . . . Optional — for tile laying.

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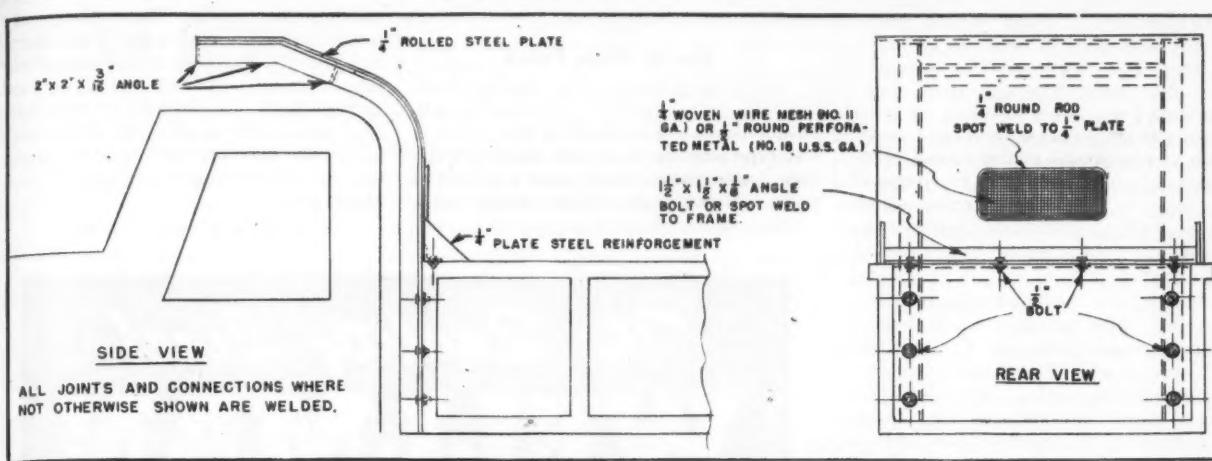
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KOEHRING SUBSIDIARY NEWTON, IOWA

**TRENCHING EQUIPMENT**





Many accidents to truck drivers on construction jobs could be averted by proper protection of the truck cab. Here is the National Safety Council's suggestion for an easily made cab protector.

## Future Bridges Will Have Beauty, Utility

Man has built too many structures that are dreary and graceless. Let him redeem himself with his bridges of tomorrow.

So writes David B. Steinman in his article "Rainbow Spans of Steel", which appeared in the July issue of *Steelways*. And as a leading contributor to bridge design, as author of "The Builders of the Bridge", Mr. Steinman is qualified to be both critic and prophet.

He is not the first such critic or prophet, certainly. In the sixteenth century, as he points out, a bridge designer called Palladio urged that bridges be "convenient, beautiful and durable". In the nineteenth, a New York carpenter-shipbuilder called Thomas Pope dreamed of a beautiful timber span across the East River to Brooklyn. And in both their days, men were building beautifully of wood and stone. But it took steel to develop fully the two most naturally beautiful bridge types—the arch and the suspension bridge.

Concerning the arch, its dynamic principles of thrust and resistance are best complemented by a deck-type roadway, according to Mr. Steinman. The natural, functional position of this roadway is above the arch where it is free from confusing intersection. Concerning the suspension bridge—the graceful curve of its "cables" is the most natural and therefore the most beautiful of all bridge outlines...the vertical hangers, like the strings of a harp, are the most harmonious and satisfying

form of filling members."

However, steel has not always built beautiful bridges. Indeed, many early designers missed its artistic possibilities entirely and built for utility alone. Later they tried to recoup by adding decorative detail and ornamentation. In that period, the engineer designed the structure and the architect added trimmings to camouflage its awkward proportions and lines. Now we are entering a third stage in the evolution of bridge design, says Mr. Steinman. The bridge designer of this era is both engineer and artist-architect. He is learning to use his new material, steel. He no longer regards it "merely as a skeleton to be clothed in some foreign raiment"; rather that its inherent beauty lies in structural form, not embellishment. And he is learning to build the "forms that express the spirit of this metal—its strength, power, and grace".

Mr. Steinman predicts more about the spans of tomorrow than their simplicity of form, beauty of line, and grace of proportion. Like their rainbow prototype, they will also have warmth of color and they will have brightness. He himself introduced the idea of color in the Mount Hope Bridge in 1929, using light tints of green, then bolder verde and jade greens. In future bridges, he predicts, somber black and battleship gray will no longer disfigure the landscape. Instead, bridge blues and greens and reds, singly or in combination, will constitute a "thrilling part of the colorful landscape". Moreover, night will not mute these bridges of tomorrow. With lighting, phosphorescent paints,

and fluorescent radiance, they will become luminous magic after dark. These "poems stretched across a river" should help to absolve man for the commonplaces he has built.

## New Blasting System

Remarkable increases in the fragmentation of blasted rock are reported for the new Rockmaster system of blasting developed by the Atlas Powder Co. The system is also said to decrease secondary shooting and the noise and vibration from blasting.

The timing between parts of a blast is controlled to within milli-seconds in the Rockmaster system, Atlas explains. A newly developed Manasite detonator and Atlas explosives selected and loaded to meet the individual job's requirements feature the system. Operators have reported shovel-efficiency increases of as much as 35 per cent, it is stated. In many cases they are shooting more holes per blast, and receiving no complaints from near-by homes.

Full details about the Rockmaster system of blasting can be obtained from the Atlas Powder Co., 904 Market St., Wilmington 99, Del. Drop the firm a post card and mention CONTRACTORS AND ENGINEERS MONTHLY.

"for All-Weather Hauling  
...without exception"



MODEL 6-SRKR  
six cylinders  
4 1/2" bore x  
5 1/2" stroke  
517 cu. in. displ.  
125 hp.  
@ 2250 rpm.

## KOEHRING DUMPTORS

powered by



## WAUKESHA ENGINES

The Georgia Coating Clay Company of Macon, Ga. have four Koehring Dumptors—all Waukesha Engine powered—in service in different mines in Georgia. Their product is specialty clays. You can imagine how the weather complicates their hauling problem.

"We have found these machines to be very satisfactory in our type of work," says their Mr. E. Y. Mallary, Jr. "Our operators have had the opportunity of observing other hauling equipment...they state without exception that for all weather conditions they had rather have the Koehring Dumper...a well built sturdy machine...we are ordering our fifth."

The all-weather tough-terrain heavy-hauling ability of the Dumper's engine—a Waukesha SRKR model—is well known. Over a million horsepower of these engines used in World War II proved their ruggedness and dependability. Today's model is more compact but more powerful, with greater speed and flexibility and higher fuel economy. Consult Waukesha on your engine needs. Get Bulletin 1124.

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Gasoline Vibrators mounted on wheelbarrow or stationary swivel base. Standard air-cooled engine, 3 H.P. or 4 1/2 H.P. Ball-bearings, silent with twin belts. Equipped with WYCO Patented Jack Shaft Clutch. Completely disengages engine. Makes starting quick and easy. No. GV902A, swivel base, 3 H.P.

**\$130**

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**WYCO VIBRATORS**

3 types: 2 for AC, single or 3-phase constant speed, direct or jack shaft step-up type. For both AC and DC a Universal Motor is supplied. No. UV916-A, 1 1/2 H.P. Universal Motor.

**\$120**

Write for Catalog and full details.

**WYZENBEEK & STAFF, Inc.**

836 W. HUBBARD ST.  
CHICAGO 22, ILLINOIS

## Snow Fleet Dispersed For Maximum Economy

(Continued from page 1)

sharp curves, and intersections.

The twelve patrolmen and their helpers begin plowing as soon as 1 inch of snow has fallen. They work continuously until every county road in each section is open to travel. Trucks, plows, and pulled graders are stationed in sheds or garages at the patrolmen's homes.

### Snow-Fighting Equipment

The scattering of light small units throughout the county has materially reduced snow-removal costs by eliminating the expensive dead haul of large trucks and V-plows from the central highway shop to distant roads. However, the County does not depend entirely on the twelve light truck and plow units stationed in the country patrol sections for winter highway maintenance. There are also twelve larger units at the central garage at La Crosse. They are used primarily to clear town roads and state trunk highways, and are also available to buck drifts or break through unusually heavy falls of snow which the light patrol-section equipment cannot handle. Three of the large units, an Oshkosh, an FWD, and an Autocar, are 6 to 9-ton four-wheel-drive trucks. A fourth heavy unit is an International 7 to 8-ton rear-wheel-drive truck. These units are equipped with Frink and Good Roads power-operated and hydraulically controlled V-plows and side wings. This equipment is used for the most difficult work. Medium equipment at the central shop includes Dodge and International 4 to 5-ton rear-wheel-drive trucks with hand-operated hydraulically controlled one-way plows.

One of the most interesting units at the central garage is a Ford 1½-ton truck with platform body, which is fitted with a Wisconsin Special V-type plow. Sand as ballast would be difficult to carry on this type of body; it would also be difficult to load and unload. So the county highway shop cast several concrete blocks weighing 1,100 pounds each, fitted at the top with rods bent to form hooks. From three to six of these ballast blocks are loaded on the truck

platform by a crane which just as easily and quickly removes them.

This unit was used last winter for the first time. The operation was so easy and the snow removal so speedy that it quickly became the most popular piece of equipment in the county. Employees argued over the privilege of driving it. Highway Commissioner Hartwig was delighted with the performance, commenting, "It's like a cat on ice!"

Three new replacements to patrol-section snow-removal equipment are International, Diamond T, and Dodge 1½-ton trucks. These have two-speed rear axles providing eight speeds forward and two speeds in reverse. Equipped with medium-size one-way plows, these units were very effective last winter in snowfalls of 1 foot. They traveled very fast and threw up banks as high as 5 feet clear of the road shoulders.

For ice removal when sleet or alternate periods of melting and freezing make driving treacherous, the County uses a Caterpillar No. 11 and a Galion motor grader, both with 12-foot blades. Stand-by equipment held in reserve for emergency calls are two older Oshkosh 5-ton trucks with Wausau V-plows.

### Radio Speeds Work

Direct radio-communication control over snow-removal units, under both normal and emergency conditions, is practiced in La Crosse County. Four of the heavy-duty trucks—the Oshkosh, FWD, and Autocar 6 to 9-ton units, and the International 7 to 8-ton truck—as well as a 1½-ton pick-up truck operated by the County Maintenance Superintendent are equipped with short-wave receiving sets. These are tuned to 3,150 kw, the frequency assigned WSTF, the 250-watt transmitter of the county highway police. The Highway Commissioner himself is in direct contact at all times with both the office and units in the field by means of a short-wave receiver and transmitter in his own automobile.

Since town roads are plowed on a first-call-first-served basis, assignments to units at work can be handled fairly and quickly by radio. The interval between a town's call for a plow, the broadcast, and the operator's acknowledgement by telephone, is rarely more than seven minutes. In time of emergency, the advantages of direct central control of heavy snow-removal

equipment are apparent.

### Use of Snow Fence

Snow fence reduces the cost of plowing, and last winter La Crosse County used 188,054 linear feet or 35.6 miles of slat-type snow fence to good advantage. Local experience over a period of years will usually show certain areas where prevailing winds year after year

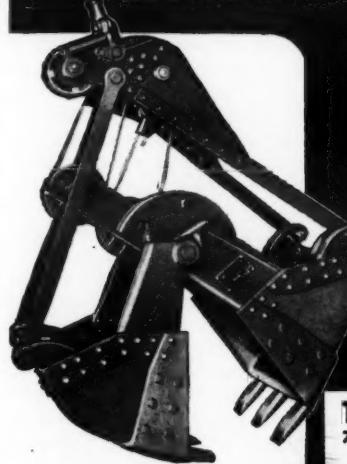
pile up deep drifts. There always are areas, however, where the wind seems to blow hot and cold at the same time, where the direction of prevailing wind changes from year to year or even during the same season. In some such areas, Mr. Hartwig has found it expedient to stagger short sections of snow fence along the road.

(Continued on next page)

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### Williams Type BUCKETS



You get longer service with less maintenance when you use Wellman Williams buckets because this quality line pioneered the field in welded construction of high-grade rolled steel. Wellman-built means better-built!

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### HIGH TORQUE

An electronic gauge accurately checks the balance of each ROCKFORD Over-Center CLUTCH, within extremely close limits, before it passes final inspection.

### POSITIVE ENGAGEMENT

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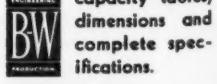
### SMOOTH RUNNING

### INFREQUENT ADJUSTMENT

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### Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.



ROCKFORD CLUTCH DIVISION

314 Catherine Street, Rockford, Illinois, U.S.A.

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E. D. ETNYRE & CO., Oregon, Illinois

# Snow Fleet Dispersed For Maximum Economy

(Continued from preceding page)

Snow fence in La Crosse County is placed about 70 to 80 feet from the center line of the highway. Placement of posts usually starts early in the autumn. The fencing itself is strung by the first of November after the posts have been frozen in place.

## County Road System

Including 280 miles of county, 250 miles of town, and 110 miles of state highways, the La Crosse County Highway Department maintains 640 miles of roads. These range from 18 to 40 feet in width and vary from dirt surfaces to concrete pavement. A breakdown of the 280-mile county highway system reveals 180.6 miles of high to low type of bituminous surfacing; 45.6 miles of gravel surfacing; and 53.8 miles of dirt roads.

The 250 miles of town roads maintained by the County are almost entirely bituminous-surfaced. Of the 110 miles of state highways, 28 miles are concrete pavement and the balance high to low type of bituminous surfacing.

The variance in width of La Crosse County roads dates back to 1911 when the first determined effort was made to get the country out of the mud. At that time, a 9-foot-wide wearing course was considered adequate for a country road. Although most town roads have since been black-topped and many miles widened to 12 and 18 feet, there remain many miles of the original 9-foot width.

County roads constructed since 1937 are standardized with 26-foot shoulder-to-shoulder widths and 18-foot wearing courses. But there still are many miles of 9 and 12-foot wearing courses in the county system. These roads are gradually being widened to 18 feet. Under the present highway standards, 100-foot right-of-ways are purchased whenever possible so that on each side of the 26-foot roadway, there may be shallow ditches and backslopes no steeper than 2 to 1.

This is not always possible because the county is rugged and rocky. On one 2.6-mile section along the ridge bordering the city of La Crosse, drifts pile

up from 14 to 16 feet deep every winter. About 55 miles of grades in the 280-mile county highway system run from 2 to 12 per cent. Here the heavy trucks with the V-plows are called on to buck through the drifts.

The La Crosse County Highway Department is reimbursed by the towns and the State Highway Commission for maintaining town roads and trunk highways over a total mileage of 360 miles. The cost of keeping 280 miles of county roads open throughout the snow season has varied from \$50.16 to \$88.88 per mile during the last four years. Annual expenditures from 1942 through 1945 for snow removal, ice control, and drift prevention, have been:

1942	\$20,000
1943	25,000
1944	14,000
1945	23,000

## Administration

The county, rich in dairy, agriculture, and manufacturing, has a valuation of \$98,000,000 and supports its Highway Department well. The approved county tax levy in 1946 for the County Highway Department is \$293,117. This breaks down as follows:

Administration	\$ 16,000
County-aid roads	56,300
Emergency road and bridge fund	25,000
County trunk maintenance	125,000
Bonus and vacation fund	45,000
County-aid bridges	5,500
FAS county road fund	50,000
Machinery fund	30,000
State allotment from gas tax	\$352,800 — 59,682 + \$293,117

An interesting figure in the budget of the Highway Department is the \$45,000 item for bonus and vacation. La Crosse County is progressive. Since 1937, the wage scale for common labor has, in effect, increased 100 per cent from 42½ cents an hour, with proportionate increases for skilled workers. During the last ten years, to the original hourly wage rate has been added a cost-of-living bonus, a week's vacation each year with pay, and a pension plan providing for retirement of regular employees of the County Highway Department. These employee benefits take into consideration changing economic conditions and increased living costs. Their adoption not only benefits the worker, but also assures the County continuance of an experienced crew of workmen.

Personnel employed by the La Crosse County Highway Department averages 68 men for office, shop, field, and

maintenance work. Employees are classified according to their highest skill and thereafter paid on that wage scale regardless of the work which they may temporarily be doing. If a man is classified as a shovel runner, he is paid the shovel runner's scale whether he is operating a crane or a 1½-ton truck.

## The County Shop

The central county shop at La Crosse is well equipped with all necessary machines to handle repair and maintenance work on the snow-removal units. Employed on a permanent basis at the shop are a foreman, a blacksmith-welder, two mechanics, a stock-room clerk, and watchmen. This force is supplemented by regular employees whose own work may be slack.

Field inspections and maintenance are carried on regularly by operators and patrolmen. Moreover, once each month throughout the year, every piece of La Crosse County equipment is brought into the county shop for a

complete servicing and inspection. At the end of the snow-removal season, patrolmen and operators report in detail on the condition of their equipment. During the summer months, the snow-removal units are repaired and prepared for the coming season. About the first of October, crews start mounting snow-plow frames, and by the first of November all units are ready to go.

Always alert to cost-reducing methods and new ways of effecting economies, Mr. Hartwig in 1938 devised a simple yet very efficient cost-accounting system which he introduced throughout the County Highway Department. Through this system, an accurate and up-to-the-minute record is maintained on every piece of department-used county-owned equipment from a drill bit to a 9-ton truck.

Here is the record of a four-wheel-drive 6 to 7-ton truck. It was operated during 1945 at a rental rate of \$2.75 per hour without operator; it brought in a

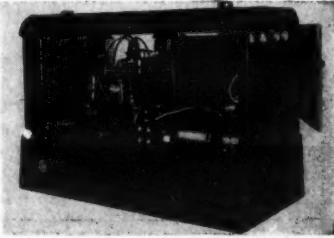
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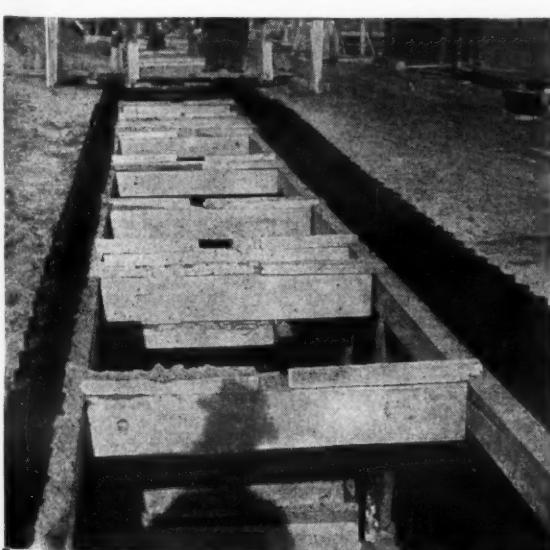
The Tamblyn System of Estimating will make a real estimator out of you in a few weeks of your spare time. We are so sure that you will want to learn it, that we will send you our complete home study course for ten days examination absolutely free. If you don't think it is the finest thing you ever saw, just return it and it won't cost you a cent. If you like it and want it, send us five dollars a month until you have paid the total price of only thirty dollars.

This estimating system is based on forty years of actual construction experience. It has been sold all over the world for more than twenty years. Thousands of estimators and contractors swear by it. Our offer isn't hot air and big talk. We don't give you a diploma or a lapel button, but we do teach you down to earth estimating which will bring you profitable business.

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This sturdy, light-weight sheeting goes in fast and easily because of its smooth surface and small displacement. It can readily be pulled and used over and over again, thus saving time and materials.

Another important advantage of ARMCO Sheet is that you can order in the exact gage and type you need. The interlocking type, used where watertightness is desired, has a covering width of 14 inches and comes in 12 to 7 gage. The flange type, commonly used in sheeting trenches, is 12 inches wide and comes in 12 gage and heavier. Standard lengths of both types run from 6 to 20-feet or more. Write for complete information. Armco Drainage & Metal Products, Inc., and Associated Companies, 1695 Curtis Street, Middletown, Ohio.

## ARMCO SHEETING



The new Hobart mobile self-propelled arc welder is adaptable to use on construction jobs, in gravel pits, and at quarries.

### Mobile Arc Welder Is Self-Propelled

A self-propelled arc welder has been announced by the Hobart Brothers Co. This welder mobile has an automotive-type transmission, with three forward speeds and one reverse. Power for both welding and travel is supplied by a Chrysler 6-cylinder industrial engine.

Welding equipment on this unit consists of a 300-ampere generator and tank carriers for oxyacetylene welding. A tool chest mounted on the rear opens in such a manner that its door becomes a workbench. Optional equipment includes a special cable reel for holding 75 feet of electrode and ground cable.

The mobile unit has its transmission connected directly to the generator. Fluid drive with rear-mounted clutch is said to permit smooth transmission of power. The unit has automotive-type controls. The clutch is of the dry-disk type, 10 inches in diameter. Mounted on springs and shock absorbers, the unit has 4-wheel hydraulic brakes as well as a mechanical hand brake.

Full details about this mobile welder can be obtained from the Hobart Brothers Co. on mention of this story. Write the firm at Box CE-96, Troy, Ohio.

### Wide Range of Diesels

Diesel engines for a wide range of duties in automotive, industrial, and marine applications are described in a 64-page brochure just issued by the Cummins Engine Co. The booklet gives a description, illustration, and specifications for each model in five series of Cummins diesels. Readers of CONTRACTORS AND ENGINEERS MONTHLY can obtain copies from the Cummins Engine Co., Columbus, Ind. Say you read this notice.

### Snow Fleet Dispersed For Maximum Economy

(Continued from preceding page)

revenue of \$1,270.98, while the actual operating cost during the year was \$1,177.58.

The expense breakdown on this truck follows:

Gasoline	\$227.33
Oil, grease	13.57
Anti-freeze	7.20
Repair labor	65.20
Repair parts	23.30
Tires	209.48
License, insurance	37.24
Depreciation	594.26

Mr. Hartwig, at a moment's notice, can provide information on any piece of county equipment right down to operating cost on a per-mile or per-hour basis.

### County Is Progressive

The La Crosse County Highway Department anticipates rather than follows trends. This is apparent in the bonus-pension-vacation plan for employees; in the adoption of a simple cost-accounting system; and in the development of simple, economical methods of handling county road maintenance. An innovation which promises success is a weekly round-table discussion between the County Highway Commissioner and his foremen and department superintendents. This system is designed to bring the experience of the men who are working on the jobs and operating the machines directly back to the administration.

Paul A. Hartwig has been successful in his 10-year tenure as La Crosse County Highway Commissioner. He sums up his experiences in the following words:

"Provided there is cooperation and understanding among the County Board of Supervisors, the County Highway Committee, the County Highway Commissioner, and the department employees, there is no county road problem which defies solution."

### Detrex Opens New Branch

The establishment of an office and warehouse at 435 Ionia Ave., S. W., Grand Rapids 2, Mich., has been announced by the Detrex Corp., manufacturer of metal-cleaning equipment and materials.

Detrex also recently established its plant headquarters and administrative offices in a new location on Woodrow

Wilson Ave., Detroit. Its mailing address is P.O. Box 501, Detroit 32, Mich.

### Motorized Highway Mowing

Motorized mowing to promote highway safety and roadside development is discussed by International Harvester in an 8-page folder devoted to the In-

ternational A tractor and the No. 18 highway mower. Operational and design features of the two units are outlined, and specifications are given.

The folder is yours for the asking. Write International Harvester Co. at 180 No. Michigan Ave., Chicago 1, Ill., and mention this report about Bulletin A-96-JJ.

## 1 - CONTRACT 8 - JOBS 11,000 Cu. Yards of Concrete

### 115 Moves

A 3/4 yd. Strayer Portable Concrete Plant averaged 24 cu. yards an hour under severe conditions, pouring 150 batches in one 5 hour period and paid for itself several times over. That was before the war — today's Strayer plant is easier and faster in operation thanks to fingertip hydraulic controls on all gates and many other design refinements.



Write today for complete data on the Strayer Portable Concrete Plant that combines vertical conveyor to 3 compartment 20 cu. yd. Bin Storage — Weighing AggreMeter — Cement Pre-mixing — Accurate Water Control — Engine Drive. All mounted on 8-Wheeled chassis permitting moving from job to job.

### STRAYER Portable CONCRETE PLANTS

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Wood Preservatives  
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The use of BITUVIA Tar road-mix over broken and worn-out pavements is enabling many states and counties to obtain greater road mileage for the available manpower and funds. This type of construction and maintenance gives a very serviceable and satisfactory road at minimum cost.

BITUVIA is equally well designed for use in Plant Mix, Seal Coat, priming and all types of road maintenance and construction involving bituminous material. Available in grades to meet all standard specifications. Send for the pocket-size BITUVIA manual.

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Note: Deliveries of Sterling Wheelbarrows are being stepped up as rapidly as improvement in the raw material situation permits.

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WHEELBARROWS

## The Public's Interest In Public Contracts

There is continued expansion at all governmental levels in the field of public contracts. Hundreds of millions of the public's dollars are expended each year on contracts for construction, alteration, and repair of public works. Such expenditures must be adequately controlled if the public interest is to be fully protected.

To aid officials and persons interested in governmental spending, the Public Administration Service has published "The Protection of the Public Interests in Public Contracts". Written by an Illinois lawyer, Herman G. James, this book attempts to outline principles underlying the letting of contracts in the public's interest.

These principles relate to securing bids, awarding contracts, and insuring full performance of the contract. Mr. James outlines the general characteristics of public contracts, classifies them as to objectives, lists general provisions for the public interest, discusses competitive and non-competitive bidding, letting of contracts, performance controls, and other phases.

The book stresses general principles, avoiding the more highly legal technicalities which vary from contract to contract and community to community. However, the author does summarize, in the appendix, national, state, and local provisions in effect on public contracts. He also includes a suggested draft of an act governing public contracts, purchases, and sales.

Priced at \$2.00, "The Protection of the Public Interests in Public Contracts" can be secured from the Public Administration Service, 1313 E. 60th St., Chicago 37, Ill., or from the Reader Service Bureau of CONTRACTORS AND ENGINEERS MONTHLY.

## Reproducing Equipment

Machines for developing and printing reproductions of papers, charts, specification sheets, and similar matter in the offices of highway engineers and contractors are featured by the Charles Bruning Co. in two new pieces of literature. Form A-1029 describes the Model 158 BW developer, said to handle roll stock or sheets up to 42 inches wide at a speed of 7½ feet per minute. Form A-1028 details the Model 40 BW printer, companion to the 158.

These folders can be obtained by writing the Charles Bruning Co., Inc., 4754 Montrose Ave., Chicago 41, Ill. Tell the firm you read this notice.

## New Filter Material For Oil-Filter Units

New filtering materials have been made available for use in Hilco oil reclaimers and Hilco Hyflow oil filters, the Hilliard Corp. has announced. The Hilco units are used to purify additive, detergent, or inhibited lubricating oils.

Adstay filter disks are now available for the Hilco oil reclaimers. This cellulose material is substituted for Hilit, the fuller's earth formerly used. Hiltex is recommended for Hyflow oil filters for filtering heavy-duty oils.

The Hilliard Corp., 102 W. 4th St., Elmira, N. Y., will be glad to tell you more about these filtering elements, and about Hilco purifying apparatus. Tell the firm you read this notice.

## Wheel Trenchliner

The new Parsons 200 Wheel Trenchliner digs trenches 15 to 26 inches wide up to 5½ feet deep. The unit has 25 digging speeds, from 2½ inches per minute to 118, and a top traveling speed of 2.7 mph. It is described in a brochure, KP-205, issued by the firm. CONTRACTORS AND ENGINEERS MONTHLY readers can obtain copies by writing the Parsons Co. at Newton, Iowa. Mention this notice.

## Data on Steel Products

A low-alloy high-strength structural steel, Hi-Steel, and a reinforcing steel bar for concrete work, Hi-Bond, are described by the Inland Steel Co. in bulletins available to you on request. The bulletins give detailed analyses, specifications, and other data about the steels.

Hi-Steel can be furnished in structural sections, plates, strips, sheets, bars, and other forms. Hi-Bond features reversed double helical ribs arranged at close intervals between longitudinal ribs to give the bar greater grip on the concrete.

A technical folder on Hi-Bond, and Engineering Bulletin 11 on Hi-Steel, can be obtained from the Inland Steel Co., 38 So. Dearborn St., Chicago 3, Ill. Mention this notice when you write.

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# 3 Tournapulls build grade... strip gravel pits... spread sub-base

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HIGHWAY JOB



10.5 to 11 pay yards of sandy clay  
were loaded down 2.8% grade in  
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